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Pennsylvania Archaeologist

Bulletin of the
Society for Pennsylvania Archaeology

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Pennsylvania Archaeologist

Bulletin of the
Society for Pennsylvania Archaeology

MEMBER OF THE EASTERN STATES ARCHEOLOGICAL FEDERATION

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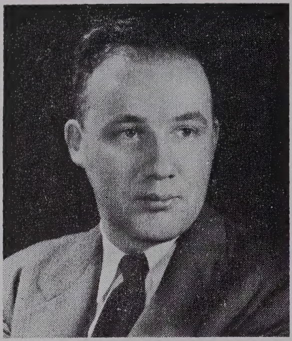

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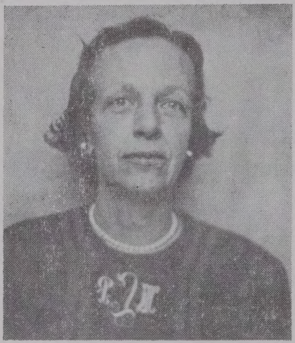

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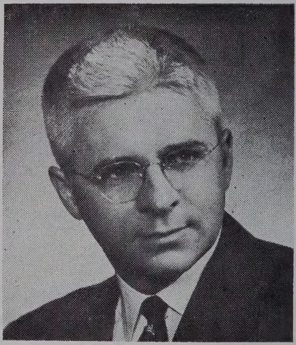

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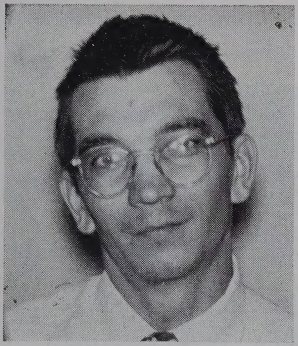

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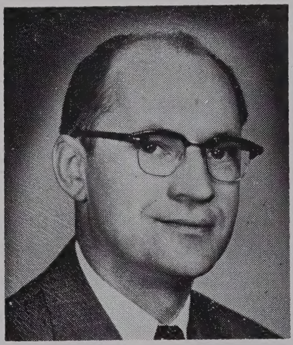

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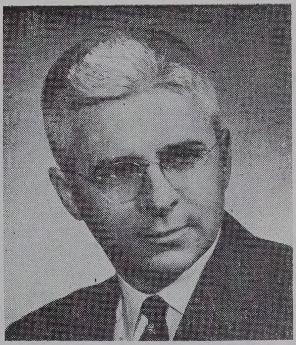

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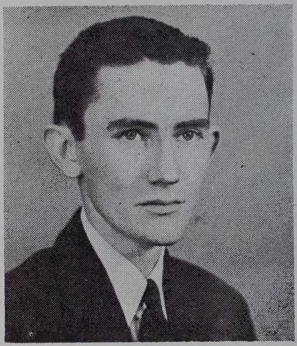

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* The photo of Miss Frances Dorrance will be found with the article "Why Our Society was Founded: An Appreciation," by Dr. J. Alden Mason.

Pennsylvania: The Keystone

By

P. Schuyler Miller,[*] President
Society for Pennsylvania Archaeology

Twenty-five years ago, as a junior in Union College, I was getting my first glimpse of the fascinating vistas opened by anthropology and archeology in a highly unorthodox course in evolutionary psychology taught by the late Professor "Johnny" March. At about the same time, the newly organized Society for Pennsylvania Archaeology published the first mimeographed issue of the journal which shortly became the *Pennsylvania Archaeologist.* We have both come a long way, to meet here in this anniversary issue.

As a Yorker born and bred, I cannot ignore the fact that the *Researches and Transactions* of the New York State Archeological Association began to appear in 1918, and that the reports and studies it has carried have established a frame of reference for much of the Northeast. But from the first, the New York journal has been a series of occasional memoirs of the sort that we too hope to be able to publish from time to time. The *Pennsylvania Archaeologist* is the oldest regularly published magazine to come from any of the state archeological societies in the East, and I believe in the country. A succession of dedicated editors, culminating in our present Dr. Vernon Leslie, has made it the most ambitious journal of its kind in our region, and most of us would say the best.

Coming into Pennsylvania only three years ago, I have gradually come to understand how well the state's title and emblem fit our particular field of interest. For in many ways, it seems to me, the archeology of Pennsylvania will key together the frameworks raised by other students in neighboring states. Here, in our river valleys, in prehistoric as well as in colonial times, was a great middle ground where the people and the ideas of North and South, East and West, met and influenced one another. Here we are finding clues which relate the early Indian cultures of all these regions to each other, and provide the strong cross-braces for a structure which will one day reveal the full story of these first Americans.

The Upper Ohio was and is the key to the West and the Susquehanna the key to the East. We are fortunate to have trained professionals and experienced non-professionals working side by side in both these areas. Up the Ohio, from the earliest times, came influences and probably migrants from the more advanced centers on the lower river and along the Mississippi. Yet the headwaters of the Ohio mesh with other important centers of Indian development: the Allegheny with the trails and waterways of the Iroquois country in western New York, the Monongahela with the headwaters of the Potomac, leading to the tidewater peoples who lived on the fringes of the great centers in the Southeast. East of the mountains the Susquehanna and its companion the Delaware make a highway from the coast into the heart of central and eastern New York. And through and across the mountains the tributaries of both systems interlace and lead the network of interlacing Indian paths which Dr. Wallace has revealed in his maps and articles.

Much of Pennsylvania was a protected and secluded country when the first traders and settlers came from Europe to the Atlantic seaboard. There are gaps in the story of the later Indians which history seems unable to fill. I think that archeology, working with history and with other

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[*] Mr. P. Schuyler Miller, 4805 Centre Avenue, Pittsburgh 13, Penna.

sciences, will fill them and that in time the story will be told and pass into general knowledge. By the time the 21st Century dawns, Pennsylvania schoolbooks may be able to tell the true story of the Keystone's first 10,000 years in place of the body of tradition and conjecture which was accumulated in the 19th Century. Even so, I cannot foresee the day when there will be no sites to hunt, no finds to talk about, no collections to study, no puzzles to unravel. In five hundred or a thousand years, members of the Society for Pennsylvania Archaeology may be digging through our city dumps, tracing our house outlines, fitting together our potsherds and trying to visualize our daily life, as we now try to reconstruct the lives of our Indian predecessors. The reports, you may be sure, will be published in the *Pennsylvania Archaeologist.*

SILVER JUBILEE

By

Vernon Leslie

The editorial originally written for this, our anniversary issue, has been cast into my capacious waste basket as a result of the receipt of Dr. Mason's account[#] of the activities preceding and causative of the founding of our Society.

It is the feeling of the editor that in addition to the tribute to the dedicated interest and efforts of Miss Frances Dorrance implicit in Dr. Mason's article, formal recognition of the part played by Miss Dorrance, Dr. Mason himself, and all of the early members and officers of the Society should be expressed on this anniversary occasion. It is an honor and a pleasure to extend such recognition at this time on behalf of all present officers and members who were not engaged in the founding activities of a quarter of a century ago. Without the amazing initial efforts and the continued support and interest of these "elder statesmen" through the years, our Society most certainly would not have become what it is today—one of the foremost learned societies of the Commonwealth.

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*Dr. Vernon Leslie, Box 168, R. D. 1, Honesdale, Pa.

#See the following article.

Why Our Society Was Founded: An Appreciation

By

J. Alden Mason[1]

The full history of the Society for Pennsylvania Archaeology for the past twenty-five years is a great desideratum, but one that requires long preparation, reading and digesting of the minutes of the Society and of Board meetings, of files of correspondence, and of issues of the *Pennsylvania Archaeologist.* I shall not steal any of the thunder of our future chronicler by recounting in detail the history of the early years of the Society; rather will I tell something of the five years of activity in Pennsylvania archaeology that preceded and led up to its founding.

In 1926 I returned to my old home town of Philadelphia after some fifteen years in Chicago, New York, and miscellaneous wanderings. It was the year of the Sesqui-Centennial. In the State of Pennsylvania Building, naturally one of the largest, I was surprised and delighted to see an exhibition of the Wyoming Historical and Geological Society of Wilkes-Barre, the results of its Indian Site Survey of the eastern part of the state; it was my first intimation that anyone else had any interest in the archaeology of Pennsylvania.

In these early days the names of the Wyoming Historical and Geological Society, and of its then Director, Miss Frances Dorrance, loom large. She more than anyone else can be considered the founder of our Society. She would be writing this little article were it not that her modesty would forbid her mentioning her prominent part as often as the facts require.

In March, 1924, the Wyoming Society, under Miss Dorrance's direction, inaugurated an Indian Site Survey of the forty-one eastern counties of the State, those in the Susquehanna and Delaware River drainages. Dr. Arthur C. Parker, formerly New York State Archaeologist and then director of the Rochester Museum, gave professional advice. Miss Dorrance and her Society were impelled to this action by the fact that, while archaeology was considered important in the neighboring States of New York and Ohio, it was absolutely neglected in Pennsylvania, and practically an unopened book. Except for isolated "digs" here and there, reported in various journals, and the unrecorded activities of amateur collectors, about the only survey that had been made was the preliminary survey of the Susquehanna from the New York State line to Harrisburg, made for the Museum of the American Indian, Heye Foundation, by Warren K. Moorehead, Dr. George P. Donehoo, and Alanson Skinner in 1916.

Thirteen thousand letters and questionnaires were sent out in 1924 to the 2100 postmasters in the territory covered, to historical and patriotic societies, Farm Bureau and Grange leaders, foresters, schoolteachers, librarians, Scoutmasters, and all known individual collectors. Posters were put up, and local newspapers collaborated with articles about the Survey. The questionnaire asked: 1) Have you personally found any Indian relics, arrowheads, flints, pottery, etc.? if so, where? 2) Give ,if possible, the exact location where any of the following named Indian remains are supposed to occur: a) forts, b) village sites, c) burial grounds, d) camp sites, e) Indian trails. 3) Where have relics been found in any quantity? 4) Where has pottery been found? 5) Where have Indian graves been found? 6) Give the addresses of any persons in your county having large or small collections of Indian relics.

---

[1] Dr. J. Alden Mason, University Museum, Philadelphia.

While, of course, with this random "shotgun" distribution, most of the questionnaires went unanswered, nevertheless the response was rather surprisingly gratifying, indicating that a large number of persons in this region were very much interested in their local archaeology, and knew of many important sites. Two thousand replies were received, calling attention to over 1900 Indian sites in this region, and to more than a thousand private collections of Indian objects, large or small. Many places were noted as requiring immediate investigation because of impending destruction, but, best of all, probably, the questionnaires afforded a list of persons who were interested in the archaeology of the State and were eager to do something about it.

These questionnaires are on file in the office of the Historical Commission in Harrisburg, divided by counties. I feel that insufficient use has been made of them. Some years ago I studied the file for Chester County and, on that basis, wrote a short report[2] on the archaeology of that county; I intended doing the same for the other counties that I know slightly, surrounding Philadelphia, but I have never got to it and probably never shall. At any rate, the questionnaires formed the basis for the exhibit of the Wilkes-Barre Society at the Sesqui-Centennial, a feature of which was a large map of the State on which the 1900 reported sites were marked, or as many of them as apparently warranted further investigation.

The paper survey, however, was only the preliminary phase of the work, as properly envisaged by the Wyoming Society and its Director, Miss Dorrance. The full program called for "field work under the direction of trained archaeologists, based on the findings of the preliminary survey, and of research in records and books, and finally the editing and publishing of the results."

The survey of the eastern part of the State having given such good results, the next move was, of course, its extension to the west of the State, and the preliminary tasks of assembling lists of addresses, enlisting the help of local groups, publishing publicity articles, etc., were begun. In January, 1927, therefore, the Wyoming Historical and Geological Society of Wilkes-Barre, urged by its Director, Miss Dorrance, began its second great archaeological project, an Indian survey of the rest of the State.

Up until this time the entire expenses of the Indian Survey had been paid personally by the Director of the Wilkes-Barre Society, Miss Dorrance, but it was obvious that work of the magnitude planned could not be carried out on this basis,[3] and other sources of finance had to be sought. The natural source was the State.

In December, 1926, an executive secretary, the Rev. Mr. J. B. Stout of Allentown, was engaged to advance the campaign for financial backing, and spoke at various meetings in its support. A bill was introduced in the Legislature and had passed the Senate unanimously when the Governor changed his plans regarding it and put the work into the Code for the State Historical Commission, allowing an appropriation of ten thousand dollars in the General Appropriations Bill for it. He also appointed Miss Dorrance, the active promoter of the Survey, a member of the Commission, of which she very shortly became Secretary. Mrs. Alanson Skinner was engaged to assist in office work and inspection of collections.

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[2] Mason, J. Alden: Aboriginal Archaeological Sites in Chester County—Pennsylvania Archaeologist, Vol. XI, No. 2, April, 1941.

[3] Eventually the Pennsylvania Historical Commission repaid Miss Dorrance for the expense of the first part of the survey.

Since the Pennsylvania State Historical Commission could not legally participate in some of the activities of the Survey, such as fund-raising, it was decided to put the work under the direction of the Pennsylvania Federation of Historical Societies. In January, 1928, the Federation assumed the direction of the Survey, the President to appoint a committee to supervise it.

Early in 1928 Miss Dorrance wrote letters to a number of prominent professional archaeologists, asking for their support of the Survey, and soliciting opinions as to its value, for publicity and propaganda purposes. Commendatory or enthusiastic replies were received from Carl E. Guthe, Chairman of the Committee on Archaeological Surveys of the National Research Council; Walter Hough, Head Curator, Department of Anthropology of the National Museum, Washington; Clark Wissler, Curator-in-Chief of the Department of Anthropology, American Museum of Natural History, New York City; F. W. Hodge, acting Director of the Museum of the American Indian, Heye Foundation, New York City; and Warren K. Moorehead, Director of the Department of American Archaeology, Phillips Academy, Andover, Mass.

In addition to the archaeological survey, research was planned among the living remnants of the Indian tribes of the State. under the direction of Dr. Frank G. Speck.

In March, 1928, I was appointed a member of the Indian Survey Committee, of which Miss Dorrance was chairman; Dr. Frank G. Speck was also a member, together with seven other men, all with archaeological interests. About this time a prospectus of the Survey was prepared, and sent to the editors of all newspapers in the State. Quite a number of them published articles or editorials on it.

During the ensuing year a number of meetings of the Indian Survey Committee were held, during which the desirability of forming a State archaeological society gradually became evident to all. The necessity of raising more funds for work than could be expected from the Legislature was also foremost in all minds. A prospectus was prepared to be sent to prospective donors. Memberships in the Indian Survey Foundation of Pennsylvania, ranging from Active membership at $10.00 to Founders at $1,000, were solicited, and appeals sent to all persons who might be interested, such as all members of the American Anthropological Association who lived in this region. The employment of a professional archaeologist to advance the publicity was considered. The John Price Jones Corporation was engaged to survey the fund-raising prospects in April, 1929. Their report was discouraging; they felt that prospects for raising the desired sum for archaeological work were not rosy. It was expected that their very large bill for their survey would be paid out of Indian Survey Committee funds, but this could not be done for some reason, and it was paid personally by Miss Dorrance. She also approached, both by correspondence and in person, a number of the most wealthy and philanthropic men in the State, but without success. It became obvious that any work would have to be done on a small scale, with very restricted funds.

Meanwhile the paper survey of the western part of the State went ahead, and in November, 1928, five thousand letters with questionnaires like those used for the eastern part in 1924 were sent out; over seven hundred replies had been received by February.

The replies indicated that a great deal of undirected or misdirected digging was being done in the State, and many important sites looted or destroyed without scientific record. The Survey Committee was convinced that, since laws prohibiting or controlling such digging seemed to be unconstitutional, a campaign of public education should be begun. The Historical Commission had a small sum of money available for this purpose, and on April 1st, 1929, Donald A. Cadzow was appointed to inaugurate this program. He began his work in the southwestern counties of the State.

Many of the persons most interested in the welfare of archaeology in the State had now been working together to that end for some time, the questionnaires had produced the names of many amateur archaeologists and collectors throughout the State, and it was coming to be felt by all that their objects could best be secured by the formation of a state archaeological society to unite in one organization without any political strings the many amateurs with the few professionals who could help to guide their activities into the proper channels.

On March 9, 1929, Miss Frances Dorrance as Chairman of the Pennsylvania Indian Survey sent out a form letter to all interested persons which began: "Because of your interest in archaeology, and as a collector of Indian artifacts, will you help us organize a Pennsylvania State Archaeological Society?

"We believe that an organization of this kind will not only benefit the collectors throughout the State by this means of exchange of ideas and information, but it will also strengthen and give enthusiasm to those who have already struggled individually in collecting Indian artifacts. By thus keeping in touch with each other, collectors in all parts of the State will know what is being discovered.

"The plan would be to have meetings in different parts of the State, with addresses and conferences, the addresses to be published and distributed among the members of the Society—probably in pamphlet form, the details to be worked out by a group of charter members."

She then invited all interested persons to attend a meeting of the Wyoming Historical and Geological Society in Wilkes-Barre Tuesday, March 26, 1929, at which meeting Dr. Carl Guthe, Chairman of the Committee on State Archaeological Surveys of the National Research Council, was to give a talk on the importance of such surveys. It was suggested that persons interested in the formation of a State archaeological society should remain overnight and get together the following morning, March 27, for a preliminary meeting.

At this preliminary meeting, Miss Dorrance was chosen Chairman of the Committee on Organization, and the present writer was asked to draw up a constitution. The suggested constitution was prepared, multigraphed and copies sent to prospective members. Miss Dorrance issued an official call for the organization meeting in Harrisburg on May 6.

At this point I should end my history of the events that led up to the founding of the Society for Pennsylvania Archaeology, leaving to some later historian the account of the actual foundation and of the early years of the Society, and of the "Pennsylvania Archaeologist." However . . .

According to my hastily penciled notes, at 2:05 P.M. Monday, May 6, 1929, in the office of the State Historical Commission in Harrisburg, Miss Frances Dorrance called to order the first meeting of our Society. I was asked to serve as secretary. Nineteen persons were present. The Society was founded, named, and a constitution adopted. The Nominating Committee proposed Dr. T. B. Stewart of Lock Haven for first president, but Dr. Stewart declined the office. It then brought in the following slate which was elected:

President—J. Alden Mason, Philadelphia

First Vice President—J. Walter Miles, Irwin

Second Vice President—Ross Pier Wright, Erie

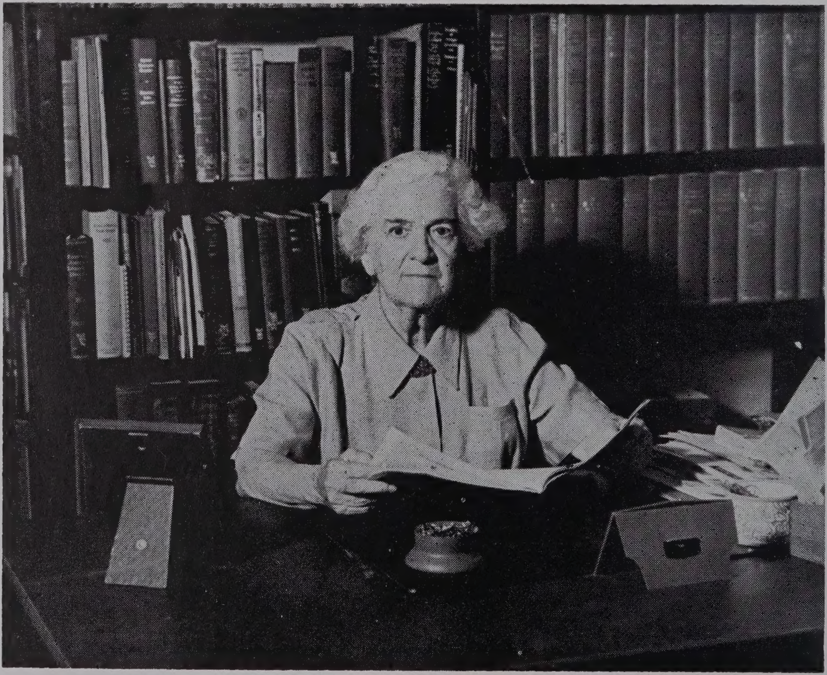
Secretary—Frances Dorrance, Wilkes-Barre

Treasurer—Daniel J. Eckman, Lancaster

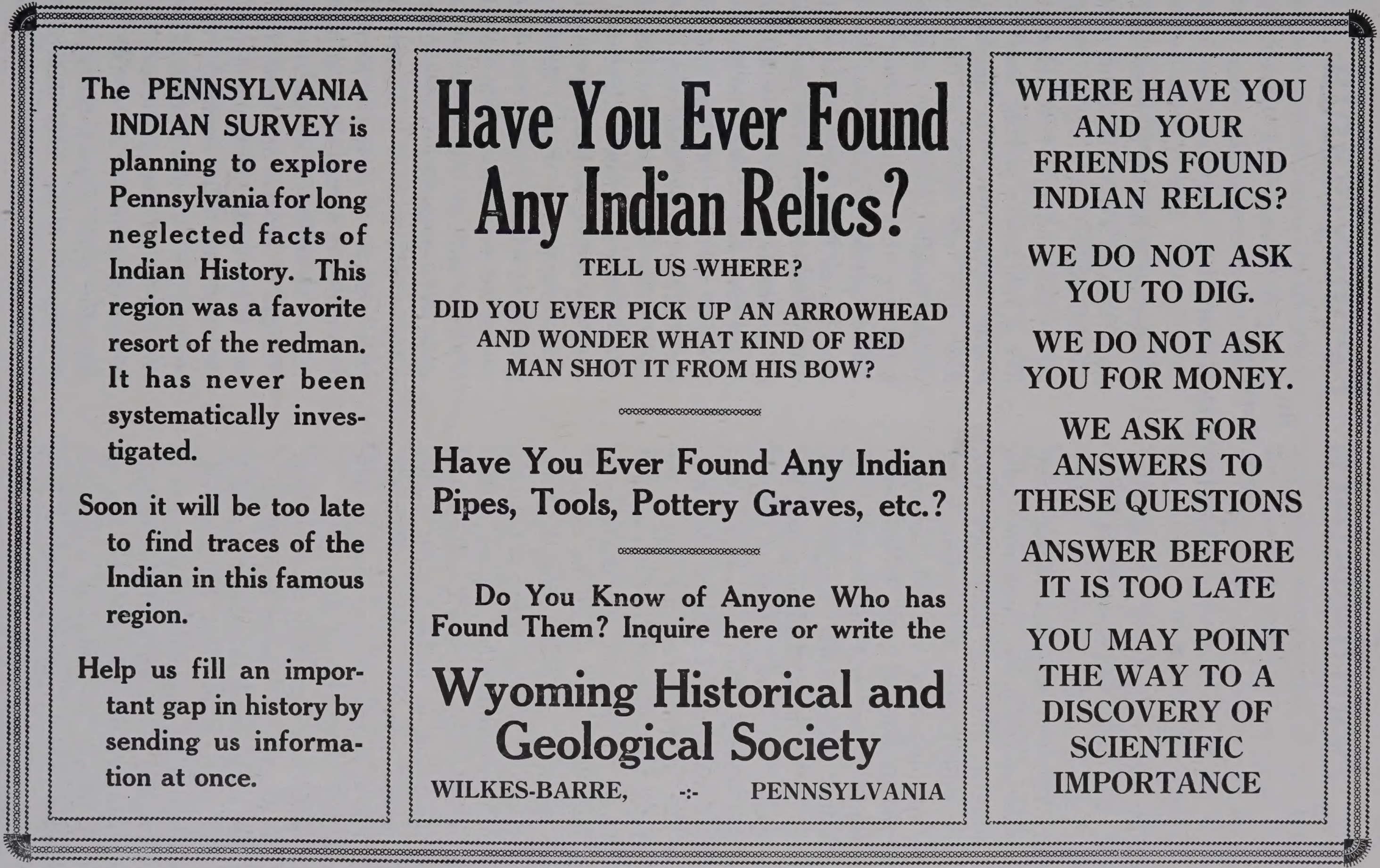
Editor—Vladimir J. Fewkes, Philadelphia

Executive Committee:
H. W. Shoemaker, McElhattan
F. A. Godcharles, Milton
T. B. Stewart, Lock Haven
James P. Cassidy, Pittsburgh
Levi Mengel, Reading
Henry W. Temple, Washington

The nineteen founder members were:
Donald A. Cadzow, Wilkes-Barre
James P. Cassidy, Pittsburgh
Dorothy Cross, Cynwyd
H. K. Deisher, Kutztown
George P. Donehoo, Harrisburg
Frances Dorrance, Wilkes-Barre
Daniel J. Eckman, Lancaster
Gerald B. Fenstermaker, Lancaster
Vladimir J. Fewkes, Philadelphia
George S. Fisher, Finleyville
Frederic A. Godcharles, Milton
J. Alden Mason, Philadelphia
J. Walter Miles, Irwin
Louise Welles Murray, Athens
W. J. Robbins, Wilkes-Barre
Boyd P. Rothrock, Harrisburg
Hiram H. Shenk, Harrisburg
Dorothy P. Skinner, Wilkes-Barre
T. B. Stewart, Lock Haven



Miss Frances Dorrance at her desk in Hoyt Library, Kingston, Pa.



The PENNSYLVANIA INDIAN SURVEY is planning to explore Pennsylvania for long neglected facts of Indian History. This region was a favorite resort of the redman. It has never been systematically investigated.

Soon it will be too late to find traces of the Indian in this famous region.

Help us fill an important gap in history by sending us information at once.

Have You Ever Found Any Indian Relics?

TELL US WHERE?

DID YOU EVER PICK UP AN ARROWHEAD AND WONDER WHAT KIND OF RED MAN SHOT IT FROM HIS BOW?

Have You Ever Found Any Indian Pipes, Tools, Pottery Graves, etc.?

Do You Know of Anyone Who has Found Them? Inquire here or write the

Wyoming Historical and Geological Society

WILKES-BARRE, -:- PENNSYLVANIA

WHERE HAVE YOU AND YOUR FRIENDS FOUND INDIAN RELICS?

WE DO NOT ASK YOU TO DIG.

WE DO NOT ASK YOU FOR MONEY.

WE ASK FOR ANSWERS TO THESE QUESTIONS

ANSWER BEFORE IT IS TOO LATE

YOU MAY POINT THE WAY TO A DISCOVERY OF SCIENTIFIC IMPORTANCE

Poster used during Pennsylvania Indian Survey.

Worn Stone Tools From Southeastern Pennsylvania

By

John Witthoft*

INTRODUCTION

The vast majority of archeological specimens, and especially of flaked stone tools, found in North America represent tools of completely unknown use and function. Furthermore, the identifications which are heard most often are mere vulgar errors, as for example the terms "skinning stone" for celt, "hammerstone" for the bi-pitted stone, "crownstone," "ceremonial stone," and "bannerstone" for the drilled spearthrower weight, "hide scraper" for the beveled planing tool, and "arrowpoint" for a great variety of pointed tools that include spearpoints, knives, and objects of many other functions. As a matter of fact, at least ninety per cent of the Indian tool kit is included in two classes of artifacts, the "arrowpoint" that the collector saves and the "chip" which he discards. There are ways of determining the function of at least some chipped stone tools, but such determinations require careful study of very large series of specimens and experimentation in tool-use; such studies must ignore previous guesses about use, and to be at all reliable, they must be reinforced with other types of data.

In some cases excavation of archaeological sites provides the answer to problems of use that seem unsolvable, as happened in the case of the tools called "bannerstones." The discovery of these objects in graves in their original positions, in alignment with other parts of the spearthrower, has answered forever the fanciful conjectures about use which formerly plagued local archeology. The discovery of grooved stone axes with their wooden handles preserved in southwestern caves has demonstrated the method of hafting by tying into a couple of loops of a whiplike withe, which was the foundation for a supple handle; the axe in the hand must have behaved much like a railroader's spiking maul with its fragile, supple haft. The discovery of at least eight celt blades in their original wooden handles in our bogs contradicts the belief that they were skinning tools; the hafted specimens were axes. Leaf-shaped flint knives have been found with their wooden handles preserved, and these hafted specimens prove what we have long believed from wear-evidence on the flints; the point of the tool was cemented into the haft and the rounded base was the working end. They were probably hide-working tools. Such fortunate occurrences as the discovery of tools with their perishable portions preserved, or of their discovery in a position of relationship to other hard parts, so that we can see the whole tool, are rare, however, and we must generally depend upon less spectacular evidence. Meticulous study of all details of large series of flint tools, analysis of their characteristics, determination of their numerical importance within archeological complexes, study of evidence of abrasion and wear, and experimental production of similar types of use-evidence, are all necessary to decide whether a certain tool type was a projectile point, a knife, a wood-worker's scraper, a hide-working tool, or an artifact for shaping softer stone. Even a cursory reading of any segment of our local archeological literature shows that such analyses have almost never been made, and that the majority of accepted function-identifications are mere guesses. I have made ambitious attempts to apply such criteria to the identification of stone tool types in Pennsylvania, and intend to publish from time to time such information as becomes available from my studies. In this paper, I intend to describe the two most spectacular and puzzling types known to me of chipped tools which show abrasion. I also list and describe types of wear and use-evidence which are of various origins, and at later times I expect to describe other tool types in the same manner.

---

*Mr. John Witthoft, State Museum Building, Harrisburg, Penna.

CRITERIA IN TOOL-FUNCTION DETERMINATIONS

At this point my discussion sounds somewhat like Walter Taylor's "conjunctive approach" to American archeology.[1] I wish to state expressly and emphatically that my procedures are completely unrelated to Taylor's "conjunctivitis." I am dealing in artifact typology, seriations, distributional studies, site analyses, and chronological studies, whereas Taylor has attacked such conventional procedures. He deplores our preoccupation with artifact description and analysis, chronology, culture stages and periods, and culture relationship statements, and claims that the archeologist should deal with relics from a site as functional (i. e. use) types, and base a description of the daily life of an extinct community upon these functional types and the associations in which they are found within the site. As a matter of fact, it is usually impossible to decide what function tools served until one has segregated a specific culture, the sum total of all the imperishable remains left by a single people or community, and until one knows what place this culture holds in a local sequence. Taylor has attacked us for working with the prerequisites! Only when studies of tool function are advanced and when a great deal of other data are available can one begin to outline the pattern of life of the community, to begin to make up a reliable description of human activities. The examples of such description which Taylor cites as models are, as a matter of fact, prime examples of conjecture based on little evidence. Taylor praises Lewis and Kneberg's *Hiwassee Island* for "putting flesh on the bones," thus singling out precisely those features of the book which can least be defended, which are highly imaginary and unlikely, and which are not based upon adequate evidence or good reasoning. Taylor sneers at Ritchie for his tremendous intellectual achievement, the derivation of chronological and geographical divisions within New York prehistory, and praises him for his lapses into conjecture about artifact usage and for his pat acceptance of a cliché, the word "acculturation," to explain puzzling problems of continuity and change in archeological history. In Taylor's own examples, he identifies bone awls as basketmaker's tools, and alleges that this is based upon study of the tools and on association data from an excavated site. As a matter of fact, Taylor's guess that awls were made to make baskets with, is based upon modern use of metal awls in coiling among Indians of California and the Southwest. In short, I believe that my own typological and site studies are small but respectable contributions to our growing knowledge of Indian life, and I do not wish them to be confused with Taylor's vapid conversation about *the science* of archeology or with his desire to set us poor fellows right on what our favorite studies are all about.

The segregation of a culture, the discovery of what types of tools were made by a single people at a single time, is prerequisite to functional interpretations of the tools. Functional interpretations of all or most of the tool inventory is one prerequisite to description of the life of the people, just as identification of the bones of their game animals, of their wild food remains, and of their crop plants is another. At the present time, in most parts of the United States, we have barely come to grips with the first step, and have only just begun to segregate and separate the archeological cultures which must be the units of study. At the same time, we have scarcely started to discover the uses to which the tools were put, and the techniques by which they were made; in both cases we must also demolish conjectures and fictions which have been foisted upon us by such earlier students as Holmes and Wilson, and which have become widely accepted commonplaces. Once we have segregated and begun to study a single culture, we must gradually work toward understanding of the whole complex.

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[1] Walter W. Taylor, **A Study of Archeology,** Memoir 69, American Anthropological Association, Menasha, Wis., 1948.

If a culture includes arrowpoints, we must try to identify fletching tools and bowmaker's tools among our relics. On the other hand, if the complex includes spearpoints, we must try to find and recognize spearthrower parts, shaftworking tools, and other woodworking tools. In both cases, if the projectile tips are flint, we must identify the flintknapper's tools. We must also try to distinguish spearpoints from the edged-tools used in butchering, and to distinguish these from edged-tools used for many other specialized purposes. Many of the tools, if we can study large enough series of examples of known type or context, will show here and there in the series some trace of wear, damage, or reshaping that is an important clue to use. One of the best examples is the characteristic form of fracture seen on projectile points which have been broken by tip impact, with high incidence of bases of these tip-impact broken points in camp sites and low incidence of tip-halves. The points were broken in hunting, the tips left in the woods, and the broken bases torn out of hafts at the camp and discarded there when replaced with new projectile points. The projectile points of a culture can be identified readily and precisely in this fashion from a proper site sample, but they cannot be identified by mere judgment of shape from a collection of whole tools, as archeologists of an earlier generation were wont to do. The tool forms which were formerly called knives in eastern Pennsylvania, because they seemed too broad, assymetrical, and obtuse to be useful for anything else, are now known to have been the ordinary spearpoints of our Transitional Period cultures.[2]

In similar fashion, the "rotary arrowhead" or "beveled arrowhead" is now known to have been an Archaic knife type. When any large series of these is laid out and studied carefully, it is found that all of them have been resharpened many times by chipping, that the amount of beveling is proportional to the number of times that they have been resharpened, that the faces near the beveled edges have many fine scratches, and that a few of them show noticeable dulling of the edges from wear against some soft and non-abrasive material, not against wood or stone. In some cases these knives started out as tools indistinguishable from the ordinary spearpoint of the same sites, but they have become much narrower and sharply beveled because of continued resharpening; in other cases, they are of a different form, with very carefully made notched bases that must have been set very solidly in a handle. Other non-beveled tools from the same cultures with similar carefully formed bases must then be examined; they also show the scratching of surface and the infrequent wear that the beveled ones show. They must therefore be included with them as knives, which have been discarded early during their use and thus have been only slightly modified by resharpening. These three series, beveled knives with spearpoint bases, beveled ones with special notched bases, and non-beveled forms with special bases, can therefore be separated from the other spearpoint-shaped tools of those cultures as a distinct knife category; since they always represent less than one per cent of the total of spearpoint-shaped tools, and because they rarely show breakage by tip-impact, they meet other criteria for separating knives from spearpoints. Only a very few of them will actually show worn edges, because they were used to cut flesh and skin, materials which contain no abrasives and which are soft; stone knives used in butchering do not ordinarily get worn in the process.

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[2] John Witthoft, Broad Spearpoints and the Transitional Period Cultures in Pennsylvania, **Penna. Arch.** 23: 4-31, 1953.

TYPES OF WEAR ON CHIPPED STONE TOOLS

The various forms of wear and abrasion which occur on the surfaces of flint and flint-like tools represent very important clues as to the past history of those artifacts. Sometimes they give evidence of the use to which the tool was put, and sometimes they are clear proof of the action of some geological agent on the tool during a period of different climate from the present. The forms of wear and abrasion which occur vary with the manner in which they were produced, and they vary less with the nature of the stone. Probably hundreds of types of surface,texturing by wear could be distinguished if the artifacts were studied with sufficiently refined techniques, but for all practical purposes a series of about ten forms of surfacing are enough and are about as many grades as can be reliably distinguished. Surfacing due to human agents and that due to natural agents can be distinguished, but the two classes have to be considered together in order that they may not be confused. In this section I attempt to describe and characterize these surfacing-categories; at the same time, I ignore all questions of weathering, patination, rinding, and other phenomena which are due to chemical agents, and restrict my discussion to surfaces formed by physical agents, by force exerted mechanically. After such listing and discussion, I shall finally get to the description and interpretation of the two tool types of my plates, and shall deal with related problems in later papers.

In the investigation of any tool type for evidence of use and wear, it is necessary to work with a fairly large series rather than with only a few specimens, especially if there is a chance that the tools are knives or tanning implements. In some series, only an occasional specimen will be worn enough for the evidence to have survived weathering and to be noticeable. The most important details of worn surfaces are their position on the tool, their form (whether facets, rounded areas, or reduction of an irregular surface), and the microscopic appearance of the worn or abraded surface. For study of very large series of tools, the stereoscopic microscope is almost a necessity, since any other optical tools involve great eye-strain in these particular contexts, and since the stereoscopic effect is very important to the detection and interpretation of scratches, bruises, and pits on the worn surface. This microscope is also a very important tool in the detection of commercial frauds among the artifacts dispersed through the relic trade, and I use the microscope and the ultra-violet lamp almost weekly in the detection of the numerous frauds which collectors bring me to pass judgment upon. The following listing of wear and abrasion varieties is based upon extensive study of these surfaces with the stereoscopic microscope, and is here presented in preliminary form; I may find it necessary to extend and revise it as I continue to study worn surfaces on flint.

1. UNWORN KNIFE AND SCRAPER EDGES. These edges are most often seen on large flakes which have not been retouched but which often have had a few chips broken away by accident during use. The knives of the modern Aborigines of north-central Australia are all of this type, and they show no wear whatsoever from use, nor any other evidence of knife function except that they are in hafts and were collected from men who were using them as butchering tools. In any large series of flint spalls of somewhat smooth or glassy surface which were used as knives and scrapers, especially if they were used in cleaning, paring, and skivering hides, it is possible to find specimens which show definite and conclusive evidence of such use. The edge of the tool is very slightly blunted and smoothed, with here and there a tiny flake broken out; the faces of the tool, adjacent to the edge, are not worn but they show many fine scratches under the microscope. These scratches were made by particles of grit and dirt which had become attached to the surface of the hide or other material being worked, and Indian life being what it was, there was always enough dirt in and on everything to mark up a knife edge or scraper edge. This scratch-pattern is best searched for on excavated material, since the weathering of surface-found specimens is often deep enough to have obliterated this pattern or to have obscured it. It is by far the most frequent use-evidence found on flint edge-tools.

2. WOOD-WORN KNIFE AND PLANE EDGES. These are seen most often on scrapers, which seem to have generally been used for planing wood (or antler or bone) to shape by paring off thin shavings. To the naked eye the surface looks polished but not glazed; under the lens, it is smooth, flat, and non-striated, but it shows scattered scratches from grit particles which the tool has picked up during use. This surface very closely resembles that of a steel carpenter's plane blade which has been dulled by work on clean, new wood. Under the lens, this surface shows no traces of polish. The first of the tool types I will later describe has worn surfaces of this sort. (Plate I, Nos. 1-8)

3. ABRASION BY FRICTION AGAINST STONE. Surfaces formed by rubbing against stone with normal force in the hand tend to be flat facets or segments of a cylinder, and they are striated in the direction of the rubbing. To the unaided eye they appear perfectly smooth, almost polished, but under the lens the surface is covered with parallel scratches formed by gouging by the hardest particles in the stone which the tool was worked against. Wear on stone drills is almost never of this type, suggesting that they were ordinarily used on materials other than stone; as a matter of fact, most drill-wear is of type 2 and indicates that drills were worn most in perforating wood. The second of the tool types which I will describe shows wear of this third type, apparently the result of abrasion against stone. (Plate I, Nos. 9-17)

4. WHEEL-ABRADED ARTIFACTS. The commonest examples of this are local flint tools which some modern individual has reworked on the grindstone, and fraudulent relics which are made to sell to the collector. The other notable examples of wheel-abraded artifacts are Egyptian scarabs of the eighteenth dynasty and later, which were mass-produced in huge numbers. Where a flint has been cut against the circumference of the wheel, it is almost always possible to find little concave cylindrical facets, which can scarcely be detected except under the stereoscopic microscope. Striae are deeper, sharper, and of course fresher than on ancient work, and the concave facets are only slightly rounded but are still conspicuous. Where the abrasion has been done on the flat of the wheel or on the "lap" of a stonecutter's bench, the striae are not straight but are arcs of very large radius. These characteristics of wheel-abrasions are often very important in the detection of fraudulent birdstones and bannerstones, especially those made of quartz and other hard stones.

4. GRIT-GRINDING BY PRESSURE AND FRICTION. The most notable examples of this are ground-glass, and surfaces produced by modern commercial sand-blasting. The surface is covered with pits and very short gouges, which vary in size with the size of the grit particles and the amount of force applied. Glass is ground by putting loose wet grit between two sheets and pressing them together with a rotary motion; the grit particles rotate, bruising the glass, chewing out pits, and making very short gouges rather than scratches. I have rarely seen this surface on archeological tools other than bannerstone drill-holes, although surfaces which closely resemble it occur. Fraudulent relics which have been sand-blasted or grit-ground as a part of the finishing process do occur, however, and this surface detail is sometimes important in their detection. A flint tool ground with loose sand against another surface should show this texture. The total absence of such evidence indicates that this technique was not used in making ground-stone tools in any part of the world that I have studied.

5. BEACH-POUNDING. Flint and quartzite tools which have been pounded on the beach of a lake or ocean show a pitted surface much like that produced by grit-grinding, except that the size of the pit varies greatly, the force with which the tool was struck being so variable. Beach-pounded tools sometimes are worn over-all, but sometimes are worn mostly on the high-points of their surfaces, this being a result of pounding on a gravel or stone beach.

6. SOLIFLUXION-GRINDING. During the intense cold and the rapid freezing and thawing of glacial times, our soils were very deeply frozen. At certain times and places, the freezing and thawing of soil masses caused great shifts within the soils, twisting, shearing, warping, and moving masses of alluvium. Stones within such soils were forced against other stones with tremendous force, chipping their edges, breaking them, and pitting their surfaces. When flint tools happened to be in such soil masses, high points of their surfaces were often ground away, producing a surface that can scarcely be confused with anything else. The abrasion resembles the surface of ground glass, but the pits are very large and the surface very rough, coarse, and deeply bruised as compared with any example of grit-

grinding or beach-pounding; the forces exerted on the surfaces of these tools were tremendous in comparison with any forces that we are able to exert to produce pitting. The pits were produced by pebbles in gravel, and the surfaces represent a gigantic example of grit-grinding. I have never seen an American tool which had been subjected to this geological agent, and the best examples come from the terrace gravels of northern France.

7. STREAM WEAR. If solifluxion may be said to produce gigantic examples of grit-grinding, stream-worn artifacts represent microscopic examples of grit-grinding. The abrasion is by impact at a point by silt, sand, gravel, and stones, but each impact has been with such minute force that each pit is exceedingly tiny and diffuse. Stream-worn surfaces on flint look quite polished to the naked eye, and have very few scratches and those short; they have a pitted texture under the microscope, with each pit very shallow, very poorly defined, and with scarcely any bruising in the stone surface. Quite generally the faces of a stream-worn artifact are more wasted than the edges, because particles striking the face do more work than those carried against the edge, and because the tool tends to slide on a face when it moves rather than rotating and striking on its edges. My best examples of stream-worn artifacts are the spear-points which the coal-dredgers get from the bottom of the Susquehanna River. Their surfaces are much smoother and finer-textured than river-worn glass, because flint is considerably harder and tougher than glass.

8. CRUSHING-GRINDING. This peculiar surface is known to me on only one artifact type, the first of the two types which I describe later. It was apparently produced by pushing and twisting the edge of a tool against a hard gritty stone, with great pressure and only slight rotation. The surface is more granular than pitted, bruised everywhere, rounded, and without polish or striation. It feels rough against the skin. It appears to have been a method of dulling a chipped edge to produce a fine-textured abrading surface. I shall discuss its probable functions later.

9. FINGER-WEAR. This is a satiny surface which appears quite polished to the eye and which most closely resembles a stream-worn surface. It is frequent on the flat faces of knives and of scrapers and planes. It is produced by wear from friction with the skin of an ancient workman, and the wear is due directly to dirt and grit caught between the skin and the tool. Under the microscope, these surfaces show a diffuse polish, with the high points of the surface most worn, and the worn surface covered with very tiny scratches of very short length and random direction. On weathered specimens all trace of the scratching may be obliterated. Knives and planes which were used for a long time and frequently resharpened tend to show a great deal of this type of wear on their flat surfaces, with the rechipped areas unworn by the fingers and a sharp division between the two areas because parts of the worn surface were chipped away in resharpening. Finger-wear is another important clue to the use of a tool, especially where it is associated with evidence of other forms of wear and of resharpening. On Plate I, No. 19 is a knife with moderate finger-wear and fresher resharpened areas.

10. GLAZED POLISH. This is infrequent on flint tools, and our most com-

monplace example of this surface is the smooth surface of commercial plate glass. On glass and on flints, a glazed polish has been produced either by melting the material or by microscopic fusing of the surface of the material. Such polishes are produced today by friction with jeweler's rouge; this is an almost grainless dust of hematite, which does not abrade the surface but which causes it to flow as an infinitely thin layer at the surface of the glass as a result of huge frictional forces. Glazed polish is a liquid phenomenon, and is one of many ways in which glasses and flints behave as supercooled liquids rather than as solids. Under the microscope, it is impossible to resolve the surface of a glazed polish into details at any magnification; it resembles the surface of a liquid or of a fused resin, and any scratches or pits are either later than the polish or relics of an earlier surface that have not been obliterated by it, rather than a part of the polish. Our most striking examples of this surface occur on flint digging tools, where long friction with dusty soils has glazed the flat faces of the tool. The broad flint hoes of late cultures of the Mississippi Valley and the narrow adze-shaped hoes of Illinois Hopewell are the classic examples, polished by tilling loess soils of the Interior Basin. Such polishes do not appear to have developed with our grittier eastern soils. Tools used in working leather might eventually be stropped to such a polish, but hides were never worked under clean enough circumstances to permit stropping rather than abrasion to produce a surface. It can also be produced by friction with plant materials which include tiny mineral grains in their fibers. In Europe, flint sickle-edges and the flint teeth from the bed of the trillo (Latin tribulum, the pre-flail threshing implement of Europe) are polished to a glaze from friction with grain stems.[3] Gizzard stones from the crops of grain-fed fowl frequently show this polish, if they have been carried long enough by the bird. Finally, glazed polish is produced by geological agents under very peculiar circumstances and is sometimes a prime clue to the dating of tools. The best examples are wind-faceted pebbles, for which I know no good English name but which are generally called by the German word *Dreikanter*. These have nothing to do with human activity, but are so common that they are important to studies of glazed polish.

The dreikanter is a pebble or a boulder that has had flat facets cut and polished by wind-blown dust, and often has been completely sculptured by this agent. They are most abundant in the glacial outwash of Long Island, but they are found scattered everywhere in our outwash, especially in the upper levels of river terraces. They are not being formed anywhere in North America at the present time, and were a product of the climate and weather of the glacial age. During our ice age, the front of the continental glacier gave off melt water during the day, with vast quantities of water and sediment pouring over great flood plains before the ice. During the night, melting ceased and the flood-plains were dry, vast stretches of sand, gravel, and ice. These flood plains were swept by winds of tremendous velocity which came from the land around and swept up over the glacial mass. On the dry nighttime flood-plains these winds carried dust, grit, and ice crystals, and their velocity was so great and the quantity of dust they swept over the land surface so large that pebbles and boulders which were exposed to them were cut and polished by wind-driven dust, and had a flat face cut on that part directed toward the wind. Some stones were repeatedly exposed to this force, and turned so that they developed several facets. When we find them, they are no longer at the spot where they were cut, but have been carried by water and redeposited in alluvium. Their surfaces are pitted, cut, and polished, with great variation in the degree of polish. They do not resemble the effects of modern commercial sandblasting, but rather of fusing a surface.

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[3] Worn sickle-flints are commonplace in Old World archeology, whereas trillo flints have rarely been described. The trillo is a heavy wooden tool, roughly the size and shape of a farmer's stone-boat, shaped from plank; its lower surface is studded with flint fragments driven into splits, and the tool is dragged behind oxen on the threshing floor to crush the chaff from the grain prior to winnowing. It was once the ordinary threshing tool of Europe, but has survived in use until recent times only in marginal areas of the Balkans and the Pyrenees, being replaced by the flail in other areas many centuries ago. The finest trillo I have seen is a specimen in the collection of Col. Henry W. Shoemaker of McElhattan, Clinton Co., Pa. He collected the specimen from a Bulgarian farmer near Gabrovo, in the Valley of the Balkans in northern Bulgaria, during one of his tours while serving as the American Minister to Bulgaria, in 1933. The specimen was hewn from ash, the splits formed while the wood was green, and it was studded with flint tools collected from local archeological sites; these tools are now well-polished.

Glazed polishes were also frequently formed by windblown dust in other places than on the outwash plains of continental glaciers; these stones show overall polish rather than facet formation. Flint tools from the Eastern Desert of Egypt are among notable examples of flints which have been polished by wind. On the Steppes of the Old World, wind polished tools are sometimes found in loess soils. These soils, like those of our Central Basin, were deposited by wind; they represent the dust that was carried up over a continental glacier by the vast anti-cyclone wind system of the ice-mass, and then dispersed over the lands to the south, re-sorted and piled up in certain areas by the wind of a dry cold periglacial climate. Flint tools exposed to the wind-drift of loess during this time of deposition frequently show precisely the type of polish that we see on our flint hoes. In the New World, such glaze-polish is especially to be expected on Paleo-Indian tools, and it has been frequently reported, but rarely substantiated. Flint tools with extreme glaze-polished surfaces are rarely found in the eastern United States, and their significance is poorly understood. Arthur George Smith has reported and illustrated a series of them from Ohio.[4] These specimens, which I have examined, probably represent marked and extreme glaze-polish by wind-driven loess, and I cannot conceive of any other explanation for their eroded surfaces, which are completely fused on every part of the tool. They were not found in loess but were on till; apparently the loess which wore them was only a superficial deposit on top of Wisconsin till, and has long since been carried somewhere else by wind or erosion. Unfortunately, Smith had also submitted these tools to other students, and Smith accepted and published their interpretation of the surfaces as beach-pounding, which is completely preposterous. Such wind-worn tools are exceedingly rare in our region, and every example should be very carefully preserved and its source studied, since the surface finish is so peculiar and of so great a geological significance.

These ten varieties of surface are all of the wear-types that I am able to distinguish on flints and related stones at the present time; other varieties very likely occur, and some of my descriptions may need revision, subdivision, and extension in light of further study of specimens and experiments in reproducing wear-surfaces. I do not believe that my discussion here is adequate or exhaustive, and I feel that we badly need more information on details of this sort from all parts of the world. There are also varieties of surfaces on flints and other lithic materials which are the result of chemical processes rather than of mechanical forces, and these also are greatly in need of elucidation; in particular, the several types of rinding and a number of types of weathering by the leaching out of some mineral constituents of flint are of uncertain significance, and are the results of processes which are poorly known. Some of these chemical modifications are also specific to certain climates and environments, and as such they can be important in the dating of archeological complexes.

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[4] Arthur George Smith, Waterworn Artifacts from Late Pleistocene beaches in northern Ohio, **Amer. Antiquity** 19: 156-57, 1953.

EXTREME EDGE-WEAR ON TOOLS FROM EASTERN PENNSYLVANIA

A great many types of tools show edge-wear in some degree or other and of several kinds, and most of them, when adequately studied, can be given use interpretations by application of the ideas which I have sketched and by use of many other criteria which are beyond the scope of this paper. However, the tool which I have decided to describe first is distinct from all of these in that it always has very blunt and rounded edges, and that all the specimens seen are more worn than examples of any other flint tool type which I have ever examined. I am not entirely certain that I know what use these tools had, but I am very certain that they are not extremely worn examples of any kind of knife, cutting tool, or wood-shaving tool. Most of the collectors to whom I have showed examples have at first refused to believe that they were anything but excessively river-worn spearpoints. They are extremely rare, and in the total of the collections available to me I have been able to find only a few more than forty examples. In shape, they are precisely like one series of Late Archaic spearpoints of southeastern Pennsylvania; in sorting over tools of this shape of quartzite, I have found this particular worn-edged tool represented by about one in five thousand; among tools of the same form of quartz and aporhyolite, they are much less frequent than this, and are so far unknown in other flinty materials. They represent a very infrequent modification of the ordinary spearpoint of a single one of the many Late Archaic cultures of this region. Comparable tools probably exist in other areas, but I have not seen them. Their closest parallels are the abraded-edged and face-worn Point Peninsula cache blade forms of Central New York, which are by no means so highly worn. My plate shows the range in size, form, and type of edge found on this tool (Nos. 1-8, 18.) While none of these tools are known with a sharp edge with incipient wear, there are certain variations in the type of edge which can be related to one another, and which indicate the way these edges were formed and a possible function for the tools. In an attempt to suggest the complexity of puzzles of this sort and to discover what use the tools served, I shall try to describe these variations in edge and their sequence during resharpening of the tool.

Ordinary examples of these tools have their edges completely worn away, so that the edge is much rounded, but is not even; irregularities in the edge were not removed by the wear, the high points were not worn down more rapidly. While the edges are completely worn, the faces of the tool are not, and even the narrowest and most worn examples show only wear of high points on the faces. The edges appear somewhat polished, and have the sort of contours that develop on an edge of a piece of wax or similar plastic material that has been eroded against soft material. Under the microscope, the polish is seen to be diffuse wear by abrasion without glazing; it appears to have resulted from wear against wood. Scratches are not frequent, and those that occur are generally lengthwise of the edge, less often oblique to it, and almost never across it. They are the tracks of grit particles which became embedded in the surface of the material being worked with these tools, and they suggest that the tool was used with a sawing rather than a scraping motion. While the surface is smooth, it shows strain lines and bruises within the stone that are not related to the worn surface, and which seem to be relics of an earlier surface and of earlier blows whose scars have been worn away. In my plate, Nos. 3, 5-8 represent this stage of advanced wear without evidence of actual abrasion. At least three of these, Nos. 5-7, seem to be completely worn out tools which have been greatly reduced in width by some sort of resharpening and which are now beyond salvage by any sort of reworking or rechipping.

Others appear more or less granular and rough to the eye, and feel a trifle rough to the finger; these, under the microscope, show a granular, slightly pitted surface which has been worn after abrading, so that the high spots on the surface have the same sort of smooth wear that is overall on the edges of the worn-out ones. They show more bruising than the worn-out ones, and some of their edges are slightly faceted. They have been abraded by pressing their edges against some hard, dense, granular stone and pushing and twisting with great force, grinding and bruising the surface away without any pronounced striation of the abraded edge. The edge which was abraded away in this fashion appears to have been a thin, sharply chipped edge. No. 18 of my plate appears to represent the beginning of this grinding; the sides of the tool are perfectly normal spearpoint edges without wear or abrasion, but the tip above my drawn arrows has been ground away to a rounded edge in this fashion; it shows no trace of polish or actual smoothness. No 2 of my plate has a tip that is very much worn, polished, and smoothed, these tip edges being the remnant of an old edge that has been resharpened. The edges back of the tip have been chipped thin, removing this worn edge, and then the chipped edge abraded in the way I have just described, producing a blunted rough rounded edge that has not yet developed any smoothing. No. 4 of my plate is a specimen that has been resharpened and reused a number of times, this resharpening being the reason for its peculiar shape. The edges of its present stage have been rechipped, abraded to produce a granular surface, and then used; the worn edge has a smoothing stage superimposed on the granular surface, so that only the tiny low spots of the edge surface are rough under the microscope. Number 1 is a specimen with a completely smoothed and worn edge, which has been resharpened by chipping; in the portion of the edge between my arrows, the worn rounded edge has not been rechipped, and was preserved intact. This specimen was lost before the rechipping had been completed and before the edges had been abraded.

I interpret these details, which I have studied on forty-three specimens, as follows: an ordinary spearpoint was set in a haft of some sort (the tangs are relatively unworn) and its edges abraded down by crushing-grinding against stone (No. 8 of my wear types) to produce a rounded granular edge. This edge was used in burnishing down the surface of wood or some similar material softer than quartzite (perhaps antler or bone), in order to produce a polished surface on a wooden tool. The motion was a sawing one, and the abraded edge served as a burnishing and polishing tool. The stone edge was worn away in the process, producing a smooth abraded non-striated surface (No. 2 of my wear types). When the edge had become completely smoothed by use, it was thinned by chipping, and then abraded to a granular surface again and returned to use as a burnisher. There may be some much simpler and more logical explanation than burnishing for these tool edges, but this explanation is the best that I have been able to derive from my study of them. If this seems unlikely, let us go on to my other tool series showing extreme wear—a really difficult problem.

TOOLS WITH FACETED TIPS

In the same parts of Pennsylvania we find spearpoint forms which have had their tips formed by grinding facets; these are not the same projectile point forms as those which were elaborated into the worn-edge tools, and are believed to represent a still later Late Archaic culture, in fact, one of the last stages of the Archaic Epoch. Most of these tools are of the forms illustrated as Numbers 9, 10, 12-17 of my plate, and the smaller examples are typical. Number 11 is the only triangular example known, and six examples are known on broad spearpoints of the Transitional Period.[5] The vast majority are of quartzite, but about ten per cent are quartz and a few examples are known of jasper, flint, chert, and rhyolite. In sorting over series of projectile point forms of the tanged shapes on which these facets occur, I have found faceted examples to be less numerous than one in a thousand. I have segregated a series of about two hundred from all of the collections available to me. At the same time I have located more than a thousand projectile points which resemble these but which were broken specimens (lacking a tip) which some farm boy or modern collector had shaped on a grindstone; the two look very much alike at first glance but can always be distinguished.

The facet-tipped tools show no signs of wear from use as knives; they bear no wear except the faceting. In each case the tip has been shaped to a thin acute point by grinding against a gritty stone. Each facet is striated from the hard grains in the whetstone, and these parallel striae are generally oblique to the long axis of the tool, sometimes parallel to it, rarely perpendicular to it. They show no smoothing or wear later than the grinding. They are usually flat facets, but are rarely convex (as No. 13 of my plate). In the majority of examples the tips are broken, apparently in many cases by tip impact, suggesting use as projectile points. Several of the examples with intact faceted tips have a tiny bruise, a "star," at the very end, again indicating impact on the point. The edges of many of these tips have been ground so that they are not sharp, by forming a facet right across the edge, but the very point of the tool is always acute and sharp where it has been preserved. In a few cases, as No. 11 of my plate, the tip is chisel shaped rather than pointed. In my plate, I have drawn pictures of the facets only and added them to the photographs; where the edge of the tool is indicated by an inked line in these drawings, that line is a facet edge, and some of these can be seen to represent facets perpendicular to the plane of the tool. I have seen much more extreme examples than any that I now have available for illustration, and specimens occur in which the grinding covers half the surface of the tool.

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[5] Witthoft, **Loc. Cit.**: 11.

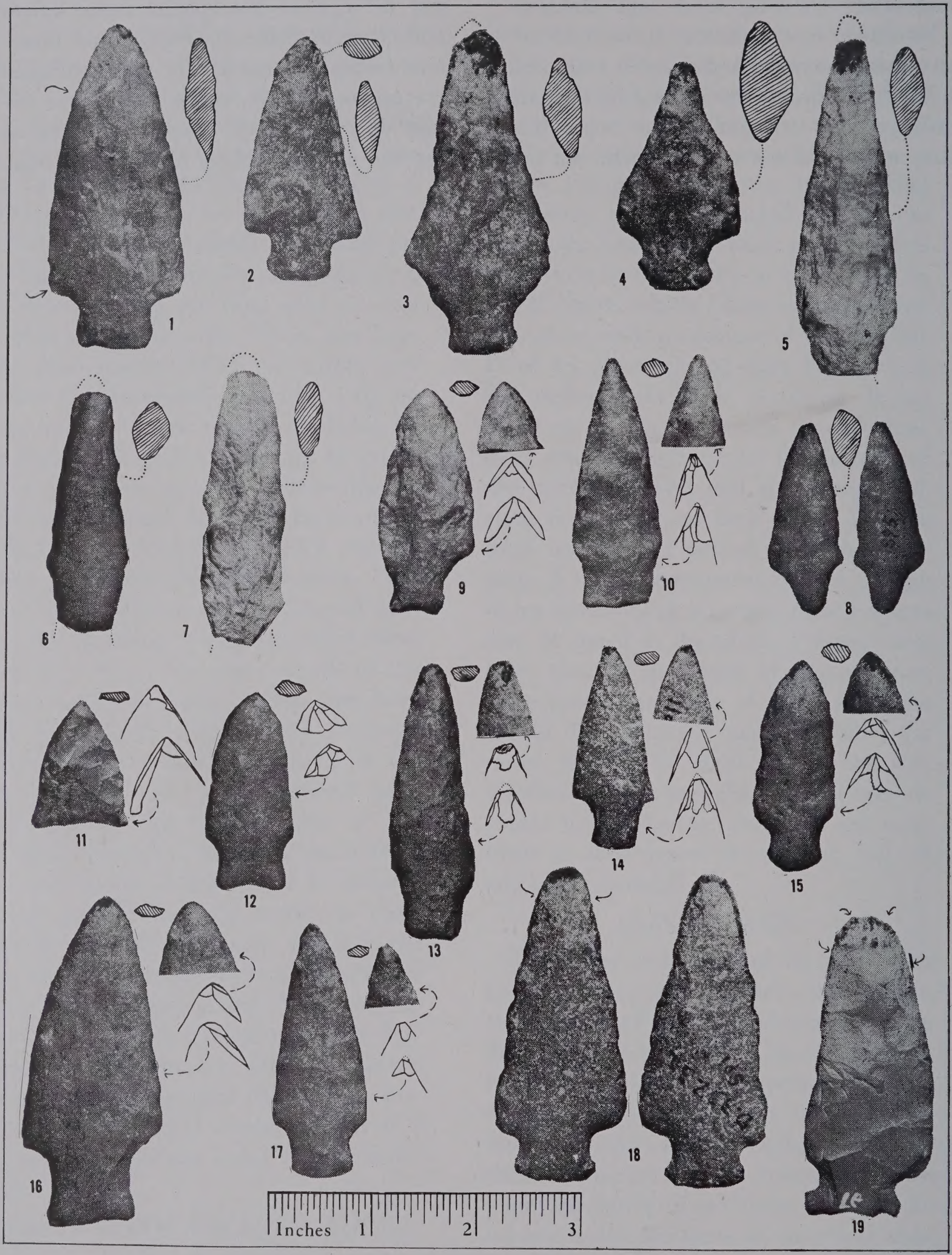
I think it is fairly obvious that these facet-tipped tools were spearpoints, and that the faceting represents one method of making a new point on a spearpoint that had been broken. Probably some attempts to repair a broken point by chipping failed, and facet-grinding was then used as a last resort in saving the point. There may have been other reasons which we cannot now fathom for occasionally grinding a tip on a spearpoint. I can readily duplicate all the features of these faceted tips by grinding a spearpoint on a flat river-boulder of indurated flagstone, but have been unable to find any harder material which makes a better grindstone for this purpose. We know from study of the facet-tipped tools that the grinding which produced them must have been very vigorous; all of the jasper specimens with faceted tips have had these facets reddened by frictional heat from the rubbing, and some of the other faceted tools have suffered heat-spalling from the frictional-heat of the grinding. However, using as much force as I can muster, I am unable to shape a faceted tip of the form noted on these tools in less than two hours, and it is the only detail that makes me wonder whether I am wrong in considering these facets as mere pointing of a spearpoint, when they require so much work to produce. Nevertheless, I cannot imagine their use as anything else, nor can I interpret them as a by-product of tool use rather than as deliberate shaping.

KNIVES WITH FACETED EDGES

Knives sometimes have facets ground on their edges during use, and are mentioned here mainly because they show some resemblances to the facet-tipped spearpoints which I have just described. Facets on knife edges are perpendicular to the plane of the tool, are across the edge, and are striated lengthwise. They were formed apparently when a knife was used to cut leather or other thin material against a harder backing, and when this backing was dirty and grit-charged enough to abrade the knife-edge. Such ground facets occur on a few examples in every large series of knives which I have examined, but are not an ordinary feature of knives. No. 19 of my plate is a red shale knife which has suffered such an accident. It has facets on its edges between the inked arrows which I have drawn to the edge of the specimen. This tool also shows moderate finger-wear on both faces, and has been resharpened several times by chipping; if the photoengraver is kind enough in his screening of my copy, these features may be noted in the plate. I should note here, that in any study of a tool series, those specimens made of shale and slate should be examined most carefully, for many varieties of these stones are very sensitive to wear and abrasion but very resistant to weathering, and they are more likely to show traces of use than tools of any other materials.

CONCLUSION

The stone industries of Archaic times included many odd ways of working flints, and many tool types which remain to be discovered because they have been confused with conventional forms. Study of wear and abrasion patterns is one important technique to the understanding of these industries. I have attempted to explain the kinds of problems that are involved, to list the types of wear and abrasion that are known to me, and to apply what we know of factors in tool wear and flint abrasion to the description and interpretation of my two most puzzling Archaic tool series showing wear and abrasion. This article is introductory to more extensive studies of worn and abraded tools, and I have included many statements that are only partially relevant, in the hopes that they may be of use to others who are trying to separate spearpoints from knives and other implements. Precise and extensive studies of these details of archeological specimens must be made everywhere before we can attempt exact descriptions of the life and technology of stone-age man.


1
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Inches 1 2 3

1-5, 9, 10, 12-18 are Hardiston Quartzite; 6, 8 are quartz; 7 is aporhyolite; 11 is black flint; 19 is red shale.

1, 3, 4, 11, 19 are from the Lebanon County collection of Sam S. Farver, 3, 11 coming from Swatara Gap, and 4 from Le 15, Ray Shannaman Site No. 2, a mixed site, mapped on the Hummelstown sheet (15 minute series) 11⅞ inches east of the west edge of the map and 8⅛ inches north of the south edge.

The remainder are in the Pennsylvania State Museum collections: Nos. 2, 8, 9, 12, 13, 15 are uncataloged. 5, 6 are D.752, from the Sacony Valley of Berks county; 10 is D.175.29, from the Tulpehocken drainage area of Berks Co., as is No. 14 (D.174.31); 16 is D.20.69, from the Wyomissing Valley, Berks; 18 is D337.32 from Fleetwood, Berks (all D. numbers are from the Henry K. Deisher collection); 17 is B647, in the Gerald B. Fenstermaker collection, from Lancaster County

Edges between the points marked by inked arrows are faceted or worn; cross-sectional drawings indicate form of wear and faceting; drawn flat projections of surfaces show only the pattern of ground facets on the facet-tipped tools.

1-8, 18 are worn-edged tools, made from spearpoints by grinding the edges by crushing against a stone, and with these ground edges used as burnishing tools. 18 has the tip edges roughened in this fashion but shows no trace of use; 4 shows this roughening but is only partly worn smooth in use; 3, 5, 6, 8 have the edges worn completely smooth by burnishing and show no surviving trace of the roughening; 3-7 have been resharpened and reground a number of times, and are hence very narrow; 1 has part of a worn and smooth edge preserved between the arrows, but most of it has been chipped to a sharp edge (the resharpening was not completed and the grinding not begun when the tool was lost); 2 shows two stages in the resharpening and re-edging process, with the tip worn out but not rechipped, the rest resharpened, ground, and partly worn by burnishing.

9-17 are spearpoints which have had their tips sharpened or repaired by facet-grinding. The drawings ignore chipping patterns and show only the ground facets.

19 is an ordinary shale knife, its faces finger-worn, its edges blunted by cutting leather against a hard backing.

Observations on The Grooved Axe In North America

By

James B. Griffin*

This is an essay on the grooved axe. Since space is limited in this anniversary number of *The Pennsylvania Archaeologist,* this is not the place to go into detail, as Professor W. K. Moorehead was wont to say in many of his publications. There are quite a number of facets of the study of grooved axes with which I shall hardly bother. It will not be possible in this essay to identify the spot where the first grooved axe was made on American soil nor when, plus-or-minus, this event took place. I am not concerned with the raw material of which the axes were made, of trade in axes, methods of hafting, the functions of axes in primitive societies, the ratio of axes to right adolescent male humeri, or a classification of axes. These questions about axes are certainly significant and no doubt there are others, such as, "How much is it worth?"

I am interested in this essay in presenting data on grooved axes, primarily from published reports of excavations, which can help to identify the general time period, the area, and the cultural unit in which grooved axes are found. This will be done on a continental basis so that the results in such a short paper are suggestive rather than definitive. I believe that it may be assumed that the objects described or named by archaeologists as grooved axes are chopping tools and that they were probably employed to cut or trim trees. I do not go so far in this association of axe and tree as did some of my European colleagues who explained the appearance of axe forms in northern Europe, following the re-appearance of forest cover, as man's reaction to the new forest environment. This same northern European forested region was also the area of, apparently, the first domestication of the dog, but this correlation has not yet been explained. I assume that most of the ground stone tools called "celts" are grooveless axes. I assume that the grooved axes of say, the area east of Wichita, Kansas, and north of Tampa, Florida, are historically connected and, therefore, that the grooved axes of Pennsylvania, and at least a five mile bordering strip on all four sides of the state, cannot be understood without knowing about the whole area. I have not included illustrations of grooved axes on the theory that anyone reading this paper will know what a grooved axe looks like, and I have given numerous references where this implement is pictured.

It is certain that ground stone axes were not in the kit of the original group of migrants from the Old to the New World. In fact, ground stone axes are not a part of the Paleo-Indian complex anywhere, nor do they appear in most areas of the eastern United States until the late Archaic. There are some suggestions that the grooved axe developed from the chipped and notched axe of the Archaic. Grooved axes are not known from most of Canada and Alaska, nor from the west coast and northern plateau of the United States. They are not a part of a Circum-Boreal culture, if any such thing really exists. The two main areas where they are found are the Southwest and the East. In the East a "center" might be established (by me) in the Ohio and Tennessee Valley. At least, that is an area, or areas, from which we have quite a good deal of excavated evidence about grooved axes which more or less accurately assigns them to temporal or cultural units.

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OHIO VALLEY ARCHAIC

At the Chiggerville Site in Ohio County, Kentucky, "The stone axes . . . are fully grooved in every instance." The total number of fully grooved axes from this site (Webb and Haag, 1939) is thirteen and four are illustrated. The Ward Site in McLean County had twenty-six whole and fragmented full grooved axes, two of which were with burials (Webb and Haag, 1940). No grooved axes are listed for the nearby Kirkland Site which is reported upon in the same publication, but on page 93 the report says, "Figure 18 illustrates the heavy stone implements common to both sites." In this figure two full grooved axes are shown. Additional sites in McLean County are described, apparently by Haag (Webb and Haag, 1947a). According to this account there were sixteen full grooved axes from the Barrett Site, some of which were found in caches with other heavy artifacts near a fire hearth (house floor?). One of the full grooved axes was at the foot of burial 248, while a three-quarter grooved axe was with burial 87. This latter axe is not listed in the final trait list. At the Smith Site (McLean County Site No. 5) there was one full and one three-quarter grooved axe. At the Butterfield Site (McLean County Site No. 7) there were fifteen full grooved axes and at the Reynerson Site (McLean County Site No. 8) there was one full grooved axe.

The most productive Archaic site in Kentucky was Indian Knoll in Ohio County on the Green River (Webb, 1946). In the W.P.A.-University of Kentucky excavation, 179 full grooved axes, both complete and fragmentary, were taken from the site. Of these, three were in burial association. Since Moore obtained fifteen grooved axes in his excavation (Moore, 1916, p. 449), this famous site has probably produced more excavated grooved axes than any other one in North America. Two of the axes in Moore's pits were "distinctly with burials."

Two Archaic sites in Butler County, Kentucky, were the Carlson Annis Mound (Webb, 1950a) and the Read Shell Midden (Webb, 1950b). At the former, forty full grooved axes were from the general digging and two more were with burials. In addition there were four three-quarter grooved axes. At the latter site there were thirty-nine full grooved axes.

The last of the Kentucky Archaic sites to be listed in this survey is the Parrish Site in Hopkins County (Webb, 1951). While this location is more famous for an eastern fluted blade complex, it also had a strong component of the Late Archaic with some thirty axes. Twenty were full grooved and three were three-quarter grooved. Seven axe bits without the haft-end were in the site debris. One three-quarter grooved axe and one full grooved axe were with a burial.

The only adequately known Archaic site in Indiana is the McCain Site in Dubois County, which produced thirty-one full grooved specimens (Miller, 1946, pp. 54-58). The first report on an Archaic site from Ohio is by Ross Moffett (Moffett, 1949), an amateur of southwestern Ohio. At the Raisch-Smith Site in Preble County he obtained twenty-two grooved axes which fits in with the pattern of the Indian Knoll Archaic, save that these axes are all three-quarter grooved rather than full grooved. Morgan (1952) illustrates a full grooved axe as part of the Indian Knoll Archaic and also regards grooved axes as Woodland.

THE ADENA AND HOPEWELL CULTURES AND THE GROOVED AXE

In the report on the Fisher Site (Webb and Haag, 1947b, pp. 85-86) reference is made to a full grooved axe from a burial association in this Adena site. This was the first grooved axe from Kentucky Adena, and the authors state that the only other Adena grooved axe was from an Ohio mound with brief notice in Greenman's original Adena study. This is, of course, not true, since in my Fort Ancient report I referred to the three-quarter grooved axes from the conical mound at Serpent Mound (Griffin, 1943, p. 58). This report Webb has read as well as Putnam's original report on the Serpent Mound excavations where he illustrated one of the axes. Then, Webb and Haag added the fully grooved axe as a new Adena trait (No. 250) but did not list it as present at Greenman's site No. 37. They refer to the occurrence of fully grooved axes in the Alabama shell midden as a significant comparison. No reference, however, is made in the trait list to the much more common grooved axes in the Kentucky Archaic sites. It is suggested in the text that such an axe might well have been picked up from an eastern Kentucky earliest Woodland rock shelter or a western Kentucky Archaic site. "Adena man," of course, would not have made and used such a tool.

In West Virginia Solecki (1953, p. 356) excavated the Natrium Adena mound and obtained a three-quarter grooved axe. He regarded it as a rare find in Adena and Ohio Hopewell, which, of course, is correct.

Moorehead briefly mentions a small mound in the Muskingum drainage which had a central burial surrounded by limestone slabs. "About the wrists were beads of copper, birdbones, elk and bear teeth, with short pieces of buckskin strings preserved by the copper; a small grooved axe and a bone awl accompanied the remains" (Moorehead, 1892, p. 25). This mound was dug by a Mr. Davis, and Professor Moorhead comments to the effect that "In all our mound explorations we never found a grooved axe. The find is certainly very remarkable."

It is my impression that the Ohio State Museum archaeologists never did get over the unfortunate inclusion of a three-quarter grooved axe in a great ceremonial offering in Mound 17 of the Hopewell group. "Grooved Axes—The grooved axe is not associated with the Hopewell culture, the specimen illustrated, . . ., being the only one recorded from a Hopewell mound. This finely made specimen, presumably a product of a non-moundbuilding tribe, may have been found by the builders of Mound 17 and added to the sacrificial offering of which it was a part." (Shetrone, 1926, pp. 197-198). It is my contention that neither the Adena or Hopewell people included the axe in their burial ceremonies except in rare cases, but I think they made considerable use of it for utilitarian activities. The Illinois evidence given below, suggests this is the case.

THE TENNESSEE VALLEY AND SOUTHERN SECTORS

There is no mention of grooved axes in the Norris or Wheeler Basin reports of eastern Tennessee or of northern Alabama respectively (Webb, 1938, 1939). In the Pickwick Basin report, Webb and DeJarnette (1942) on page 257 imply that grooved axes (number, type and size unspecified) come from the primarily "preflint" horizon in the Mulberry Creek Site, Ct°27; and Plate 290, Figure 2 has three full grooved axes illustrated from the site. One grooved axe is listed on page 42 from the general digging of site Lu°5. One grooved axe is included in the list of artifacts from Lu°25 (page 70). It was found two feet from the head of burial 8 (page

64). I found no data in the report which gave the location of this burial. There were two grooved axes from the general digging of Lu^{o}59 (page 122). They are full grooved forms as shown on Plate 150, Figure 2. According to the list of traits in the Pickwick Basin report, of the shell midden dwellers, fully grooved axes were found at five of the seven shell midden sites, and at three of the four most typical sites (pages 312 and 315). Lu^{o}72 is listed as having the fully grooved axe but it is not specifically mentioned in the text.

In the report on the Whitesburg Bridge Site (Ma^{v}10) Webb and DeJarnette (1948b) assign a three-quarter axe to their Archaic 3 (Late) period (page 24). The "grooved axes" are regarded as a part of a "pure" cultural manifestation. In the chart on page 31, listing artifact occurrences by zone, we find one grooved axe from Zone B, nine from Zone D, seven from the "trenches" and one from "refuse." Thus the eighteen grooved axes from this site represent almost three times the number from the other Pickwick Basin sites. "Of 18 grooved axes, all were of limestone except two of quartzite and three of slate. Three of the axes were fully grooved, eight were ¾ grooved, and the remaining seven were broken so that the extent of the groove was not determinable. Combined pecking and grinding were extensively used in shaping the axes. All of the axes showed grinding except two which appeared to have been shaped by pecking without grinding." (Webb and DeJarnette, 1948b, p. 33)

Even more grooved axes were recovered from the Flint River Site (Ma^{o}48). Webb and DeJarnette (1948a, p. 47) refer to them as follows. "Grooved axes were made of limestone except one made of sandstone. Thirteen of the 28 axes were fully grooved, eight were grooved on three sides, one had two sides grooved, and one a groove on one side only. Five were so broken it was impossible to distinguish between a full groove and a three-quarter groove. Occasionally (sic.) the edges of the groove were slightly raised producing a ridge of flange [?]. Combined pecking and grinding were extensively used in shaping the axes. All axes showed grinding except three which appeared to have been shaped by flaking and pecking. A typical limestone celt, hoe, side notched hoe, and grooved ax are shown in figure 29. It will be observed from the artifact summary how these limestone implements seem to be most prolific in Zone C. While they may have been in use at this site after limestone pottery began to be used, they are clearly to be assigned as to origin to the pre-pottery time horizon."

In the second report on the Perry Site, Lu^{o}25, (Webb and DeJarnette, 1948c) a partially flexed burial (No. 546) was at a depth of three feet and attributed to the "Shell Mound cultural placement" with a full grooved, pecked and ground limestone axe. Another similar axe was found at the same depth with a group burial of partly flexed shell mound burials (Nos. 616 to 620). A single three-quarter grooved axe was found in the two foot level. It was also made from limestone. A similar axe was taken from the general excavation.

At the Town Creek shell heap—Colbert County, Alabama—Fowke (1928), along with other Archaic materials, recovered what appears to be a full grooved axe. On page 441 of this report Fowke says that it "was a small side notched hoe, which might easily be mistaken for a much-used grooved ax." A single grooved axe fragment came from the Little Bear Creek Site (CT^{o}8) in Colbert County (Webb and DeJarnette, 1948d).

I failed to find any grooved axes in the report on the excavations in the Guntersville Basin of north central Alabama although sites were excavated there with occupations of the correct time periods of Late Archaic to Middle Woodland on which quite a few grooved axes were found in sites immediately to the west.

In eastern Tennessee full grooved forms are attributed to both the Candy Creek and Hamilton complexes by Kneberg (1952, Fig. 103, EE) and Rowe (1952). They are quite rare in excavated sites in this area.

Dr. Clarence H. Webb (1948) includes a full grooved axe as a part of the Poverty Point Late Archaic complex. This is, of course, on the basis of surface collections as is his assignment of similar forms to Late Archaic from sites in northwestern Louisiana. His suggestion for this area is born out by the experience of Robert Stephenson in his work in east Texas. Stephenson tells me that there is a good association between grooved axes and Gary Stemmed projectile points on non-ceramic sites of Late Archaic time in the Texarkana area.

THE ATLANTIC DRAINAGE

An examination of the recent numbers of the Massachusetts Archaeological Society bulletin indicates that full grooved axes are a part of the inventory of what Fowler calls the "Stone Bowl Age" which immediately preceded the early ceramic period (Fowler, 1952a and 1952b; Bullen, 1952). The full grooved axe is recognized as rare at excavated sites in southeastern Massachusetts and the Cape Cod area. Axes are also found on ceramic (early) sites in Cape Cod and northeastern Massachusetts. Willoughby (1935), writing without benefit of modern knowledge of stratigraphy in New England, assigned the axe to "The Algonquian Group in General." From his long years of acquaintance with collections in New England he knew that the axes were found throughout New England but were rare in the Maritime Provinces. He illustrates a variety of full grooved forms and one three-quarter grooved specimen. Both Willoughby and Moorehead knew that the grooved axe was not found in Red Paint (Maine Burial Complex) graves in Maine but did appear in the shell heaps. Moorehead thought this might be an important fact.

The full grooved axe is part of the Orient complex (Ritchie, 1944, pp. 227-235) of the eastern Long Island area and is in the preceramic levels of the western Long Island area (Smith, 1950, p. 141). Smith has listed grooved axes as of rare occurrence on Early to Middle Woodland period sites in the general New York City area. One of the most surprising and interesting features of this survey is that the grooved axe is not a part of either the Lamoka or the Laurentian of the central New York area. Indeed, grooved axes are not prominent at any time in this area. It would look as though the grooved axe was not part of the early ground stone complex of the New York Archaic and that its origin is not to be looked for there.

Very recently in *The Pennsylvania Archaeologist* there was an article on the grooved axes of eastern Pennsylvania (Witthoft and Miller, 1952) which discussed with some skill various problems about the stone axe as an effective tool and other matters, but there was very little about the stone axes of eastern Pennsylvania. I do not know where Whitthoft got his data for his earlier opinion that "on the basis of surface collections and midwestern excavation data, that the full grooved axes are of early Woodland age and that the three-quarter grooved axes are of Middle Woodland age." The authors indicate their belief that eastern Pennsylvania axes are Late Archaic in age. On this same page there is a misleading footnote about the number and significance of grooved axes in the Tennessee Valley which I have been at some pains (not to mention those of the reader) to correct.

The late Karl Schmitt (1952, pp. 59-62) pointed out that the Red Valley complex of the New Jersey Archaic on the basis of excavated data has a full grooved form, while the Early and Middle Woodland sites had three-quarter grooved forms. In the Potomac Valley of eastern Virginia a full grooved axe was obtained from a Late Archaic to Early Woodland site (Manson, 1948, p. 225). Farther south in the North Carolina Piedmont, Coe (1952) suggests the ground stone grooved axe follows the chipped and notched axe and that the Savannah River Focus people of Late Archaic times had the full grooved form. The later Badin folk made the same kind of axes as the Kentucky shell mound Archaic. The Yadkin Focus of primarily Middle Woodland times has the three-quarter grooved form which has replaced the full grooved form. After Yadkin times the grooved axe is replaced entirely by ground celts. Farther south full grooved axes are a part of the Savannah River Focus of the eastern Georgia coastal plain (Fairbanks, 1942), while in central Georgia during Swift Creek times—equivalent to Hopewell—the three-quarter grooved axe is well made but is not a common trait of the complex (Fairbanks, 1952, p. 287). Grooved axes are rare to absent in Florida. I shall not mention the ones in the West Indies until Rouse does.

UPPER MISSISSIPPI VALLEY AND THE PLAINS

In a publication on the southern Illinois area (Cole, 1952), the brief statement on the Baumer Focus does not mention grooved axes, but the trait list included in the statement on the earlier Faulkner Site has full grooved axes listed for the Baumer complex.

In southern Illinois Maxwell (1951, p. 122) mentions only "One fragment of a diorite grooved axe on top of the basic clay at the very bottom of the midden." Maxwell also refers to an unpublished correlation of surface finds in southern Illinois which indicated that grooved axes, "bannerstones" and plummets were found in the same localities. In the Early and Middle Woodland sites excavated by Maxwell the celt was replacing the grooved axe.

By far the greatest concentration of excavated grooved axes in the Illinois area is around St. Louis during Late Archaic to Early Woodland. These finds have briefly been described by Titterington (1950). By cross-ties, these sites are clearly linked to Archaic sites to the south and to Black Sand, Red Ochre and the Old Copper complex to the north. It should be noted that an essentially similar complex of behavioral pattern and material remains came from the burial caches in field areas and also in the mounds. At the Hartford Church field site in Jersey County, Illinois, there were seven grooved axes. They "have rounded polls and broad blades. Six of them are three-quarter grooved while the seventh is full grooved." In the north end of Marquette State Park, also in Jersey County, two extended burials covered with limestone slabs had, among other items, two grooved axes. These two diorite axes were quite small.

A number of sites in Calhoun County, Illinois, are included in the Titterington Focus. The Godar Site near Hardin along with a considerable amount of bannerstones, plummets, projectile points, and drills also had twenty-five grooved axes or fragments thereof. At the nearby Etley Site, which was made up of two low mounds, there were also twenty-five grooved axes.

Near St. Charles, Missouri, two sites are important in this study of the distribution of grooved axes. At Elm Point, a mound had been removed with a slip scraper. During the removal, red ocher covered burials with plummets, turkey tail blades, and a tubular pipe were found. Shortly after this operation another collector found a grooved axe at the site. The Gronefeld Site, over a short period of time, enriched different collectors. In the best haul, the collectors obtained three grooved axes with red ocher covered burials.

Tittering'on also reviewed three separate finds on the Hempill farm in Brown County, Illinois, where a three-quarter grooved axe was found in one of the burial caches.

In central Illinois the Black Sand complex at the type sites had two full grooved and one three-quarter grooved axe (Cole and Deuel, 1937, p. 149).

In the Starved Rock area of northern Illinois, Peter Stewart, a field man for W. K. Moorehead, found a three-quarter grooved axe under the soil thrown out of a subfloor pit which had been excavated to receive a group of extended burials. This Mound 1, of Utica Group 2, is part of a large Hopewell occupation in the Utica area (Griffin and Morgan, 1941). The axe is 6¼ inches long and 4⅜ inches wide. A second three-quarter grooved axe was found on the bottom level of Mound 2, Utica Group 2. This axe is 4½ inches long and 3¼ inches wide.

In the Lewis Mound Group at Meredosia, Mr. J. L. B. Taylor, a field foreman, excavated a number of mounds from which very little material was recovered (Griffin and Morgan, 1941, p. 7). In Mound No. 2 at a depth of 6 feet in the south edge of the mound there was a small grooved axe. The groove was very shallow on the two faces. The axe is 3½ inches long, 2⅜ inches wide and 1 inch thick. This mound also had two cord-marked body sherds, one Havana Plain rim with a horizontal row of bosses, and an excellent Hopewell rim.

At the Snyders Site, C^v117, in Calhoun County, Illinois, a University of Michigan excavating party in 1947 found a three-quarter grooved axe in Level 8, at a depth of 42-48 inches. This is a predominantly Hopewell village site and the axe is, I think, attributable to this culture group.

Mr. Walter Wadlow found a full grooved axe at the Manker Site in eastern Pike County, Illinois. This is a predominantly Hopewellian site with a small amount of Late Woodland pottery. This collection is now in the Museum of Anthropology at the University of Michigan.

Little can be done about precise association of grooved axes and cultural groups in Wisconsin since apparently no axes have been recovered from excavations at village or mound sites. Heretofore, both full grooved and three-quarter grooved forms in their several varieties in Wisconsin were regarded as part of the Woodland Pattern. It was thought the Effigy Mound Aspect in particular had fluted axes because of their presence in fields adjacent to the mounds (McKern and Ritzenthaler, 1945, 1949).

One of the more unfortunate associations of grooved axes is that ascribed by Shippee (1948) to the Nebo Hill complex of the Kansas City area which, on the basis of the long narrow leaf-shaped projectile forms, is regarded as belonging to a period which might either be late Paleo-Indian or Early Archaic. Collections from four sites included ground three-quarter axes from each and ground stone celts from three of the four sites. Throughout much of the area where the grooved axe is found in the past, it is evident that the celt succeeds it and becomes the dominant ground stone chopping form so that their association with such assumed early lithic forms I regard with a jaundiced eye. It would be much better if these ground stone forms were the result of short trips for wood by the Hopewell people who had village sites in the neighboring valley.

In the Ozark area of Missouri, Tong (1954) has discussed an Archaic period collection from the Cox Site. Among other "behavior patterns" left by the former inhabitants was a ground stone axe. "It is of the full-grooved variety and was formed by pecking and polishing. The material is limestone, a rock commonly used for ground stone axes farther south along White River."

A brief note in the *Missouri Archaeological Society News Letter* for January, 1955, mentions a stratified rock shelter in the Table Rock Reservoir area of southwestern Missouri in which the middle layer is Hopewellian. "A full grooved ground stone ax was associated with this pottery complex."

Surface finds from northwestern Missouri confirm the presence of both full grooved and three-quarter grooved axes in that area (Stubbs, 1950). It is unlikely, however, that the full grooved axes are part of a Mississippi culture as Stubbs suggests.

Wedel (1943, pp. 57-59) obtained three of the three-quarter grooved axes from the Renner Site. One of these was from his own excavations. Another polished stone form that was excavated he regards as an unfinished grooved axe. An unfinished grooved axe came from the surface of Steed-Kisker, a Mississippi site near Kansas City. There are also mentioned surface collections from southern Wyandotte County, Kansas, and from a site near Leavenworth (pp. 102-103) that had a Hopewellian complex and three-quarter grooved axes. A village site "down river from Kansas City" (p. 103) of Hopewellian character also produced grooved axes as part of the cultural complex of the Renner and allied Hopewellian people. Similar axes, he notes, "have been found repeatedly throughout the Great Plains, if we may accept the statements of amateur collectors. The type is most plentiful, apparently in the eastern portion, diminishing in frequency with increasing distance west of Missouri. Most of the specimens are surface finds, and the horizon to which they are assignable has remained uncertain" (p. 195). Dr. A. C. Spaulding informs me that grooved axes are fairly common in eastern Kansas. Since they are not part of Upper Republican and later cultures, it is reasonable to infer that they belong to earlier cultural groups.

Baerreis (1951, p. 66, Pl. III, J) describes and illustrates one full grooved axe from northeastern Oklahoma which is attributed to his earliest pre-ceramic level within what he called the Grove Focus. This focus he felt was associated with the eastern Archaic.

The Fourche-Maline sites of central eastern Oklahoma have the unfortunate habit of changing from a pre-ceramic to a ceramic level without fair warning. Many of the artifact forms are found in other Archaic to Early Woodland sites east of the Mississippi. The full grooved axe is very rare (Bell and Baerreis, 1951, p. 23, Pl. 4, No. 2). Other ground and polished stone forms include reel-shaped gorgets. Perhaps Webb and Snow (1945) and Spaulding (1952) who would move Adena people and Adena culture into the Ohio Valley from south of the border would have Fourche-Maline as a way-station.

SOUTHWEST AND MIDDLE AMERICA

Woodbury (1954) has an excellent analysis, classification and commentary on full and three-quarter grooved axes at the site of Awatovi and in the Southwest. The full grooved form appears in small numbers in the Basketmaker III-Pueblo I Anasazi northern area but did not become common until the Pueblo III-IV times. The full grooved form was used in the Mogollon area after the San Francisco period but was never very popular. The three-quarter grooved axe seems to appear in the Hohokam area first and to be the dominant form in that culture. The Hohokam were excellent artisans in stone and their distinctive axes approach those of the East in quality of workmanship if not in variety. This type of axe appears in northern Arizona in Pueblo II times and is accepted in many northern sites by Pueblo III-IV.

Many archaeologists in the Southwest believe the grooved axe came into the area from Mexico along with other elements and into the Hohokam first. As Woodbury indicates, Ekholm in his 1942 publication on northwestern Mexico suggested the grooved axe had entered that area from the Southwest. Woodbury mentions Gladwin's theory of the axe as a "Cordilleran" trait which entered the Southwest from Texas or the east coast of Mexico; neither of these areas is notable for its grooved axes. Gladwin has, sensibly, withdrawn his idea of a "Cordilleran" complex (Gladwin, 1948, p. 238).

Stubbs (1953, p. 104) believes the Hohokam three-quarter grooved axe is definitely earlier than the Pueblo full grooved form and is derived from the Hohokam southern Arizona area. Reed (1951, p. 47) has suggested that the Pueblo axe is a combination of the axe form from Hohokam and a full groove from the early mauls in the Anasazi area. Reed, following Sauer and Brand, seems to think that the Hohokam axe came in from Mexico where it is said to occur in Sonora, Chihuahua, Durango and down the western side of Mexico to Michoacan. There is very little evidence of grooved axes in the literature from this area. Dr. Isabel Kelley (1945, p. 73) mentions a full grooved and three-quarter grooved forms from Jalisco, illustrates three-quarter grooved forms from Sinaloa (1938, Pl. 22), and a three-quarter grooved specimen from Michoacan (1947, p. 133). Farther south Kidder (1943) has published a short note on four grooved axes from Guatemala, one from Nicaragua and one from Costa Rica. The Guatemala axes are full grooved as are the two from Nicaragua and Costa Rica. The latter, however, are not as well finished nor do they have the same form as the Guatemala specimens. The age of these specimens is unknown and Kidder felt that these axe forms were not to be connected to those in the north.

In my mind there is considerable doubt about the Mexican source of Southwestern grooved axes. I have examined the references given for Mexican finds and in none of them is there evidence either of the requisite age or number of specimens that you would wish to have for a cultural donor. The evidence I have read would indicate diffusion from the Hohokam-Mogollon area to Mexico and not the reverse.

The temporal position of the grooved axe in the eastern Plains is such that it could have furnished the inspiration for the southwestern forms. One of the difficulties for such a transmission is that the three-quarter grooved form is most common in the east after, say, 1 A.D., and the most logical area for the introduction of the axe from the eastern Plains would be the Anasazi region. As we have seen, however, it is in this region that the full grooved form is the earliest and dominant type and, according to many southwestern archaeologists, the well-developed Hohokam three-quarter grooved form precedes all Anasazi axes. If the priority of the Hohokam is based on the 1936 Snaketown report assignment of the axe to late Pioneer, then someone might suggest it rests on slender evidence. The Hohokam were excellent workers in stone artifacts and emphasized this material more than did the Anasazi. This may be one of the reasons for the superiority of the Hohokam axes in the Southwest. Quite recently Hurt (1953, p. 219; Wendorf, 1953, p. 136 and Woodbury, 1954) have recognized the possibility of a cultural connection between the eastern forms and those of the Southwest. Evidently there are still some things in American archaeology about which we need to know more in terms of time and space relationships.

SUMMARY

This survey has, I think, indicated rather clearly that the grooved axe has a geographic range from New England to the Southwest and western Mexico, and from Minnesota to the Gulf drainage. This is a fairly wide distribution. The time span in the East is somewhere in the range of about 3000 B.C. to perhaps 1000 A.D. in some marginal areas of the Mississippi culture development in the north. The axes in the Southwest are not significant until after 500 A.D. and were still in use up to the Spanish invasion. The celt form which becomes dominant in the eastern United States by about 500 B.C. or earlier does not appear as a characteristic tool in the Southwest. We do not know yet where the grooved axe form appeared first in America, or why. Nor do we know why it ceased to be a popular tool, unless the celt was found to be an implement which was easier to make and to haft. It is doubtful whether radiocarbon dates at the present time are sufficiently numerous or exact to help us with the precise place of origin of the axe.

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COURSE IN ARCHEOLOGY

This summer, from June 27 to August 5, Temple University will conduct a class in eastern United States archeology. The course, designated as Sociology & Anthropology 131s, will award 6 semester credits to students successfully completing the instruction and field work.

An important site has been selected in west-central New Jersey for full-scale excavation. The course will be conducted by Dr. Jacob W. Gruber of the Temple University Dept. of Sociology and Anthropology. Mr. Ronald J. Mason, from the University of Pennsylvania, and a member of the Society, will direct the field work.

The purpose of the course is to instruct in professional archeological investigation, and will involve class room and laboratory instruction and about twenty days of actual field work. In addition to archeological theory, methodology, and practice, the elements of basic physical anthropology will be presented. The petrology, typology, and chronology of New Jersey, Pennsylvania, and related artifacts will be studied, leading, after completion of the excavation, to an analysis of culture sequence and evolution in this area.

All inquiries should be addressed to Dr. Jacob W. Gruber, Dept. Sociology and Anthropology, Temple University, Broad Street and Montgomery Avenue, Philadelphia 22, Pa., or to the Director of Summer Sessions, Temple University.

The Northern Burial Cult

By

William A. Ritchie,* State Archeologist
New York State Museum and Science Service[1]

In a monograph now in press,[2] the writer has presented in some detail the archeological evidence in support of his thesis that a cult of the dead flourished in the northeastern United States, Southern Ontario, and elsewhere in the Great Lakes area during the Early Woodland period; that it became widely diffused among disparate cultures; and that it contained the roots of the subsequently elaborated Adena, Hopewellian, and other mortuary manifestations of the more advanced cultures which reached their apogee in Middle Woodland times.

It is his belief that the basic mortuary practices indicated by the data, especially from the most recent excavations of the New York State Museum and Science Service, justify the assumption of a complex funereal ceremonialism woven around a set of religious concepts pertaining to immortality and the welfare of the individual after death. (It is also possible that considerations affecting the security of surviving members of the social group against maleficence from the spirit world were somehow involved.) The cult idea would seem to have encompassed more or less definite notions regulating the treatment of the corpse, selection of a burial locus, disposition of grave goods, and use of symbolic objects and substances. Thus the core of belief apparently led to the temporary entombment of the body in a charnel house; the subsequent cremation of the green bones; and the pit interment of the incinerated remains, together with burial offerings pertaining both to secular and ritualistic categories.

On the Indian River sites in northern New York, we investigated crematory structures of a hitherto unrecognized type comprising low heaps of varying sizes of fire-shattered rocks, as shown on Plate 1. Cremated human bones were still present in several instances. Pit graves, up to six feet in depth, were discovered in trenching nearby mound-like natural knolls, invariably situated on the eastward-facing slope or summit. The selection of such locations gives rise to speculations concerning the genesis of artificial mound construction in later times; the orientation suggests solar involvement, and its usual attendant, fire ceremonialism, is amply attested in these and other burials within the cult pattern.

Thus burned offerings of various kinds were of frequent occurrence, both with cremated and uncremated human remains which, incidentally, sometimes occupied the same grave pit. In every instance we found varying quantities of red ocher, usually enveloping the human and industrial contents. Unquestionably, the red powder carried a symbolic significance, perhaps as a restorer or giver of life, apparently an ancient concept of sympathetic or imitative magic based upon its color resemblance to blood.

Another probable inference from the evidence disclosed concerns a concept of the indestructibility of the spirit of concrete objects, especially well revealed in the intentional breakage of grave offerings, which everywhere appears to be a feature of the cult.

In connection with possible sun-fire ritualism, the occurrence in almost every grave of the means of making fire deserves special mention. These fire-making kits comprised masses of iron pyrites, long since decomposed into limonite, occasionally preserving impressions of bark tinder or wrappings, and flint strikers, often interfused into the residual lump. (See Plate 2, figures 1 and 4.)

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1. Published by permission of the Director, New York State Museum and Science Service, Journal Series No. 2.
2. Ritchie, William A. **Recent Discoveries Suggesting An Early Woodland Burial Cult in the Northeast.** Circular 40, New York State Museum and Science Service, Albany. In press.

Two graves, one on either site, yielded among a wealth of additional objects, many more than 200 exquisitely chipped, extremely thin, leaf-shaped blades, which the writer believes belong in the symbolic category with the red ocher and certain other materials.

For the most part, the cultural content of these graves, some examples of which are illustrated on Plate 2, marks a distinct departure from the typology of the preceding Archaic horizon cultures and, together with Vinette 1 type potsherds found in the immediate vicinity of some of the stone crematories, suggests the introduction of a novel complex, perhaps also involving the spread of a new ethnic group into the Northeast at this time. There are discernible, however, in Late Archaic period cultures in this area, certain burial traits which hint at an indigenous development of the cult idea. We can, therefore, at present form no conclusive opinion regarding the origins of this cult.

A temporal overlap of the Archaic and Woodland sequence segments is implied by the extremely early radiocarbon dating for the Indian River stations. Dr. Libby's measurements produced a figure equivalent to approximately 2,500 B. C. (‡260 years), by far the earliest dated expression of the Woodland pattern and of mortuary ceremonialism in the New World.

While carbon^{14} determinations are still eagerly awaited on two specimens from burial stations of the Orient manifestation on eastern Long Island, it is obvious from prior excavations of members of the Long Island Chapter, New York State Archeological Association, and from recent work on the Jamesport Hill site by the New York State Museum and Science Service,[3] that the Orient complex, although diverse in most material traits, presents a nice transition from Late Archaic into Early Woodland, in terms of the currently employed criteria of differentiation. All paramount features of the northern burial cult, already described for the Early Point Peninsula sites on the Indian River, are markedly in evidence here, viz., primary entombment above ground; cremation of bone bundles, in this case apparently, for the most part, within a large communal pit grave; intentional destruction of offerings of tools, weapons, ornaments and utensils, also evidently of food; and the symbolic usage of ritualistic materials, including red ocher. (See Plate 3.)

Further evidences of the practice of this cult have lately been coming to light in excavations within their state by the Massachusetts Archaeological Society. Here again, most of the specific traits of the material culture differ from those of the New York Point Peninsula and Orient manifestations referred to. This fact tends to strengthen the writer's hypothesis of the wide and early diffusion of a religious cult of the dead which, in the light of the temporal and cultural evidence adduced in his monograph referred to above, would seem to provide a part of the foundation of the more elaborate mortuary ceremonialism culminating in the Hopewellian horizon.

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3. Ritchie, William A. "The Enigmatic Orient Culture" (Abstract of). The Bulletin, New York State Archeological Association, No. 2, pp. 11-13. Albany, 1954.

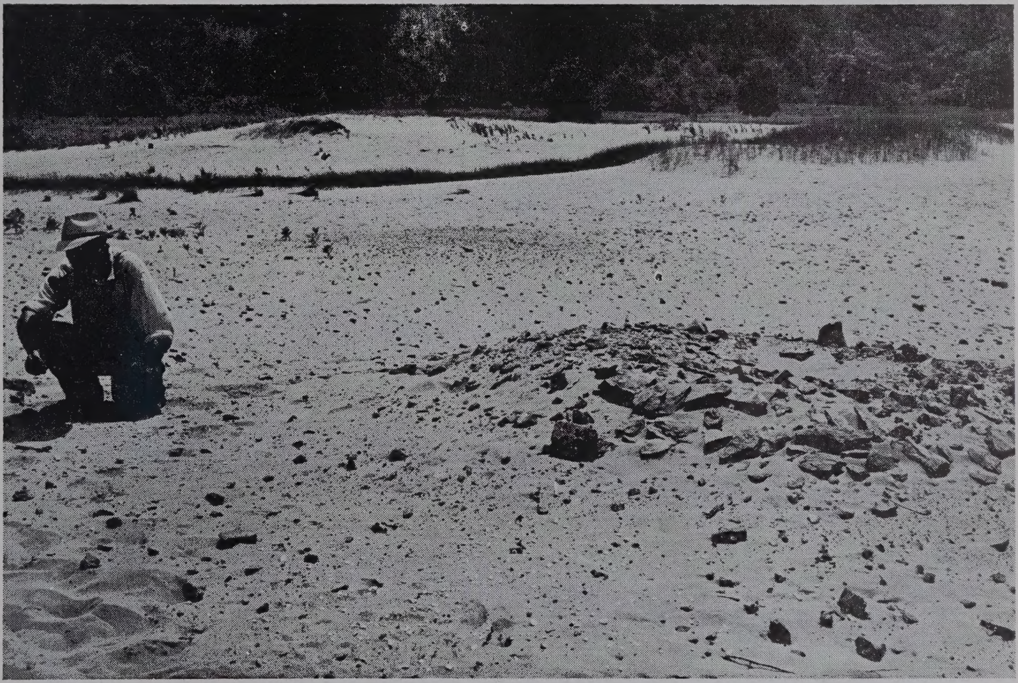


Plate 1. A stone crematory with burned human bones (in foreground) on the Indian River.

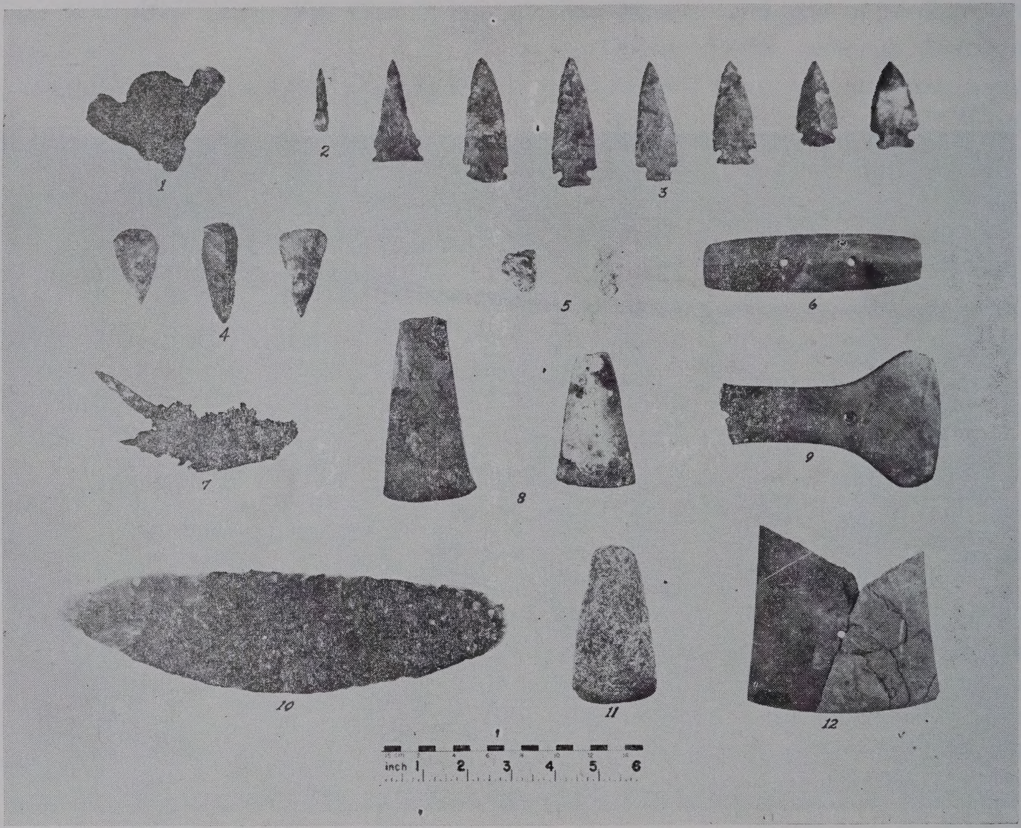


Plate 2. Some of the grave goods from the Indian River sites. 1, fire-making set (with two interfused strikers); 2, drill; 3, corner- and side-notched projectile points; 4, flint strike-a-lights; 5, unmodified lumps of galena; 6, 9, 12, various gorget forms (12 was shattered in a crematory fire); 7, unique copper flaking tool in carved wooden handle (still adhering to fragment of bark grave lining); 8, copper adzes; 10, unique knife of smoky chalcedony (found in "killed" condition); 11, stone adze.

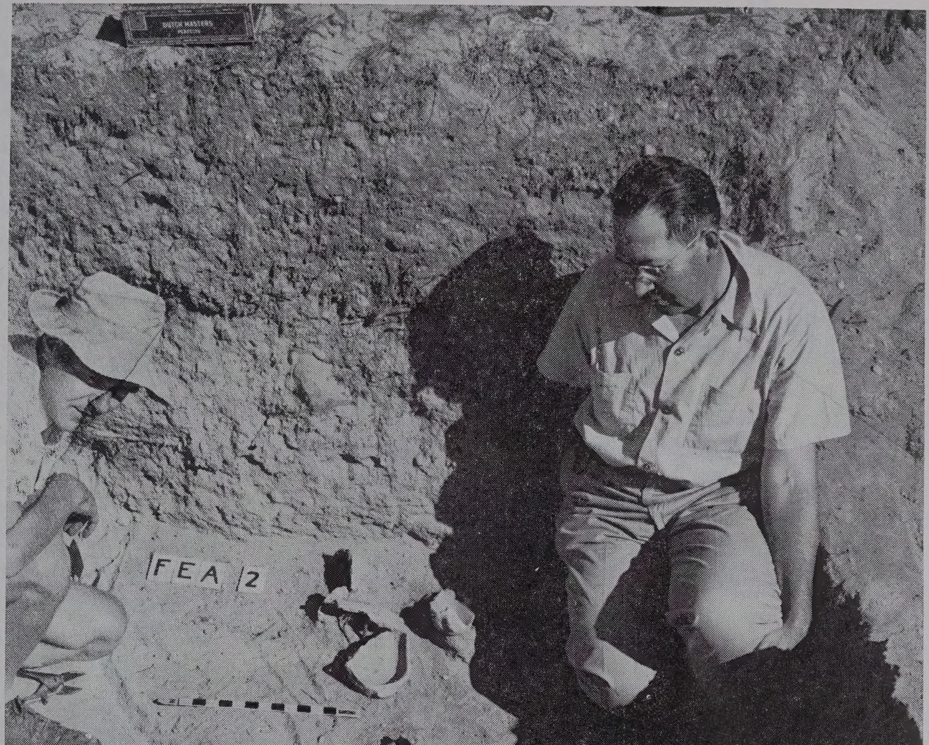
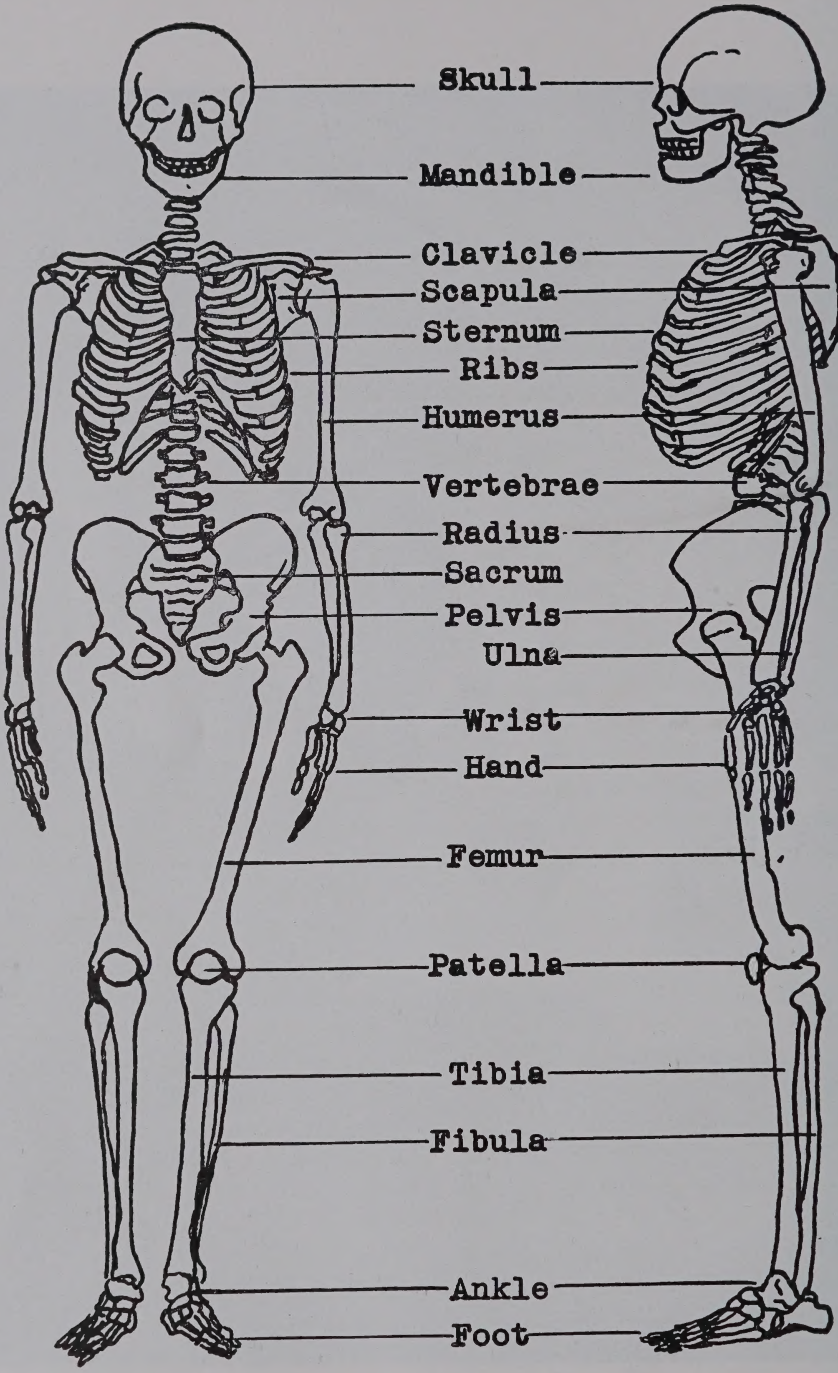


Plate 3. Part of a deposit of "killed" steatite pots, projectile points, and other artifacts (including fire-making equipment) in a grave pit at the Jamesport Hill, Long Island site of the Orient Focus. State Science Service excavations, 1953.


Skull
Mandible
Clavicle
Scapula
Sternum
Ribs
Humerus
Vertebrae
Radius
Sacrum
Pelvis
Ulna
Wrist
Hand
Femur
Patella
Tibia
Fibula
Ankle
Foot

BONES OF THE SKELETON

See VINCENT R. MROZOSKI
Looking for Artifacts — Part 6 — Page 72

Power Tools And Archaeology

By

James L. Swauger*

So much major construction work is being undertaken today that archeologists are being forced to give more and more attention to what is generally called "salvage archeology," the rescuing of archeologically significant data and objects from sites threatened by construction projects of one kind or another. The danger may be that of imminent, rapid, and total destruction of sites due to their contents and forms being broken and dispersed by earth moving machinery, or the barring of archeologists from sites for many years, even "forever," because of the covering of sites by waters of dams, surfaces of major highways, or atomic wastes. There is, of course, the balancing factor that some of this construction work brings to light sites that otherwise might never have been known, so all is not despair in the face of modern feverish building of dams, roads, bridges, parks, factories, homes . . .

Salvage archeology in the sense of an archeologist's saving what he can for archeology from excavations of a commercial nature is not new, of course, as television and automatic washers are new. Half a century ago the highly respectable Heidelberg man and the now not so respectable Piltdown man came to light because of commercial diggings, and they are but two of a long list of discoveries so made. But the immensity and great numbers of recent commercial excavations all over the United States have brought salvage archeology to the fore as a respectable and needed procedure to most of us only within the present generation.

A pattern for governmental recognition of the archeological possibilities presented by widespread, large scale excavation has been established by such work as that of the WPA in the 1930's in the Tennessee Valley Authority region, and the continuing effort of the River Basin Survey of the National Parks Service. These activities are immense and spectacular.

Less spectacular but equally valid examples of salvage archeology are known to most amateur and professional archeologists. Excavating contractors digging out cellars or scooping for gravel or top soil have been the source of information leading to such investigations as that of John Witthoft at the Cass Site (36Br57) near Towanda, Pa., in 1948 (1), and that of John Zakucia and others at the Bolinger Site (CM 36Lr21), near Edinburg, Pa., from 1952 forward (2). Other kinds of private industry have taken an interest in aiding such salvage work as that of Ralph Solecki at Natrium, W. Va. (3). Carnegie Museum recently received permission from the Duquesne Light Company for salvage archeology at Shippingport, Pa., on the site for the new atomic-power light plant (4).

It is more than likely that tips and requests for investigations of sites will be coming in ever increasing numbers to archeologists. Unfortunately most calls of which I know have been concerned with burial locations. Harder work by archeologists in educating the general public to awareness of clues denoting other kinds of sites should bring about the reporting of villages, camps, quarries, rock shelters, and work shops.

Salvage archeology is necessary and fruitful despite its frustrations for those accustomed to working deliberately according to their own set plans. It is important that those of us interested in archeology in this age of mechanized excavation avail our-

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selves of the opportunity to work with commercial diggers and learn what their tools can do for us. That the day of salvage archeology has arrived, is not entirely deplorable, and holds promise of good for archeology was the general conclusion of a meeting of professionals in July, 1954, at Fort Hill, Ohio, called by the Ohio Valley Archeological Conference to discuss this particular activity.

There are, of course, many facets of salvage archeology which bear study: archeologists generally cannot direct the direction, speed, and methods of the commercial excavator; discoveries made by this method are ordinarily fortuitous and are not concerned with a program of research; the commercial excavator is in business and, with the best will in the world, must get on with his job even at the risk of spoiling archeological materials. Not all commercial excavators either recognize or care about an archeological site. This article is concerned only with observations of heavy excavating machinery in action and opinions as to the worth of various kinds of such equipment to archeologists.

During 1953 Arthur M. Hayes, hired as an Assistant Archeologist by Carnegie Museum for the period 26 January through 9 June, and I worked at a site being excavated by power tools. The occasion was the grading operation at the Point State Park in Pittsburgh, Pa., to prepare the area for roadways and park contours. The Section of Man, Carnegie Museum, was hired by the Department of Forests and Waters of the Commonwealth of Pennsylvania to collect all pre-1800 artifacts brought to light as grading proceeded, to salvage as many bricks from the walls of Fort Pitt as possible, and to map new features located and check old ones against former maps of the fort (5).

We followed the work of an impressive group of power equipment: power-shovel, motor crane with clam-shell bucket, Gradall, Hi-lift, bulldozer, grader, cylinder and sheep's foot rollers, trucks, air-hammers, and hydraulic jacks. The word "followed" is used advisedly since by the terms of our contract we could not direct any excavation unless some of this equipment revealed a fort feature during the course of its regular work. When this occurred, we could stop grading operations and hire enough of the machinery to clear the feature for study and recording. Otherwise we walked behind, beside, and over these machines as they tore and ripped at the ground.

The power-shovel's duty is to dig out a large quantity of earth with one sweep of its bucket and to move it away. It is not a precision instrument. The Lorain shovel in use at the Point State Park was not a particularly large one, yet it ordinarily sported a bucket with a two-cubic-yard capacity. That meant fifty-four cubic feet of earth were rent from the ground at each bite. Small objects were well concealed if they were within this mass of earth. The only hope presented us observers anxious to find gun-flints, buttons, buckles, and the like, was that some of these might spill from the bucket's dribbling lip and be recognized in their fall or as they hit the ground. Another opportunity for observation was given when the bucket's base fell away and earth cascaded into a waiting truck. Then the load was loosened to some extent and objects tumbled freely over the mound of dumped earth. There was an interval of perhaps three minutes between the dumping of one bucket load and the dumping of the next, and the archeologists had only that span of time to investigate each load as it spilled into a truck.

The front plate of the bucket made a clean, slightly packed, horizontal cut on the ground clearly revealing ground mottling sufficient to indicate differences in the fill at the Park site. I have little doubt such gross features as large pits or post mold alignments encountered in investigation of American Indian sites would readily be exposed by power-shovel bucket action. This is particularly true if the shovel's job is, as was the case at the Point State Park, the clearing of earth to prescribed levels over fairly large areas.

Another portion of a power-shovel, the treads, exposed a feature of Fort Pitt. Part of the stockade line along the north wall of the fort came to light when the right tread sank a foot or so below grade level and ground a little trench along the south side of what is left of the stockade posts. This happy turn of events is hardly predictable, however, and it is not recommended for consideration as an exploring technique.

The clam-shell bucket mounted on the Lorain motor crane digs and moves earth, but it has neither the capacity nor the strength of the power-shovel. At the Point State Park the bucket usually in use had a one-cubic-yard capacity. Its action was not powerful enough to tear out cement walls or hard ground as did the big shovel. The clam-shell worked as a rule in loose soil or gravel in places where the power-shovel's bucket would have been too wide, too likely to tear out something which shouldn't be moved, or actually a waste of the shovel's strength, a man at a boy's job. We found the clam-shell bucket fine for working along the fronts of brick and stone walls since the bucket would only scar them. The big shovel, of course, would have jerked loose whole sections of such walls had one of its teeth become hooked into the wall. The clam-shell bucket dripped far more than did the shovel bucket and was more likely to give up small objects. Its yard of earth was much easier to go through with the fingers than the two-yard load of the shovel. The clam-shell was an efficient tool for pulling up single objects, cement blocks, sewer pipe, sections of masonry, and the like, and we used it when transferring Fort Pitt brick from one place to another.

The Gradall digs earth by means of a small bucket mounted on a long boom. The bucket's mouth faces back to the cab of the machine which provides its power, and the digging action is a scraping motion back toward the cab. Since it is attached to the end of the boom by what is almost a universal joint, the bucket moves with almost the motions of a man's cupped hand. It is an agile tool that can dig a remarkably clean, narrow trench, or daintily pick a half-yard of earth from the side of a cut. Its load of earth is so small it can be easily and rapidly checked, and its sureness when directed by a good operator is such that we used it to clean mud from the face of a brick wall.

The caterpillar Hi-lift is a tracked machine with a toothed scoop in front. In action the Hi-lift pushes its scoop into earth until it has a load, then lifts it almost vertically for deposit in a truck or on some other spot of the excavation. Its scoop leaves a clean, horizontal surface and, as does the front plate of the power-shovel bucket, shows clearly features of size and distinction. We found this true at the west end of the stockade line along the north wall of Fort Pitt where the Hi-lift alone cleaned the smudge extension of the stockade line along the last quarter of its length. Along the rest of the wall, the Hi-lift cleaned out the earth to a depth of about eighteen inches so close along the sides of the stockade that the final cleaning of the logs with shovels was a scraping, not a digging, proposition.

The prime duty of a bulldozer is pushing earth. It can dig into solid earth for a depth determined by the hardness of the soil and the power of the motor, but essentially it is a pusher. It is, above all others, the tool that can be of use to an archeologist. At the Point State Park we knew the approximate location and depth of the wall from which we hoped to secure good specimens of Fort Pitt brick in quantity, and our contract permitted us to hire power tools to reach and exploit this cache of brick. A caterpillar bulldozer operated by Wesley Welfer cut down to the wall, a depth of eleven feet, in a trench thirty feet wide and one hundred feet long in a little less than five hours. Welfer had been told all we knew of what the fort wall would probably be like. His blade had no sooner touched the top of the remains of the stone wall than he reported its presence to us even though at the time the wall could not be seen because of the cinder and earth fill at this point. Once having located the top of the wall, Welfer ran his twelve-foot, tremendously heavy, steel blade along about an inch above the wall's top and cleaned it nicely to this level. He said, and we were inclined to believe him having seen him stop to back and raise his blade, then go forward, several times, that he could probe with the blade since he knew by the "feel" of the machine when he had hit such a structure as a wall. Such a man with such a machine can do a tremendous amount of clearing in a short space of time with efficiency.

Bulldozers were used to spread earth dumped by the trucks. As the blades leveled off the piles left by trucks, dirt feathered out at the edges and objects were readily seen. While the treads ground the earth over which they passed, and while their general effect was only to pack the dirt under them, they did on occasion bring objects up from earth already packed. We found it profitable to check earth thrown out to the sides of the blades or thrown up by churning treads.

For final spreading and shaping of contours, the grader was used. It is a machine essentially the same as a bulldozer, a blade pushed by a power plant on wheels. It has very little power and is used for final shaping of contours. We found it gave much the same opportunity for seeing items as did the bulldozer but only with items almost at the surface or on the surface.

Both the cylinder and the sheep's foot rollers worked to pack earth to a solid surface. Neither of these was useful to us at Fort Pitt since neither did much to expose objects and in all instances they worked on earth already torn out by other machines. Now and again the sheep's foot roller did bring items up from packed fill, but not often enough to make it worth our while to follow it.

The trucks, of course, were used to carry and dump earth. As indicated in discussion of use of the power-shovel, we did check loads as the digging tools dumped them into trucks, and we did check them at the fill areas as they were dumped from trucks. As earth poured from the rear of trucks, objects rolled away from the falling earth. The area of fill in which trucks were unloading was a fruitful one for seeing objects, and usually one of us was at the fill.

In order to save as much original Fort Pitt brick as possible, we tried to chisel bricks away from their mortar bed by hand with hammer and chisels. We discovered the mortar was so hard we frequently shattered bricks before we could cut sufficient mortar out to free them. As last we decided to lose some bricks deliberately in order to save others, and at one wall area we used air-hammers hired from the excavating company. These worked very well as they forced their chisel heads down behind blocks of bricks in regular patterns that resulted in the cutting loose of many blocks of perfectly good Fort Pitt bricks. We resigned ourselves to losing about twenty-five per cent of the bricks when we used air-hammers, but we'd been losing about fifty per cent when we worked at them by hand.

One machine we did not use ourselves but which we saw in use was a horizontal hydraulic jack. It was used to split enormous concrete foundations for pillars and walls into chunks manageable by the power-shovel. Holes were drilled into these foundations by air-hammers, the opposed plates of the jack with an expansion tool between them were inserted into the holes, and pressure forced to the expansion tool by a hand screw at the machine's oil reservoir pushed the plates apart and split the concrete. Such a jack conceivably would be of use to cut away dangerous overhangs, to cut great boulders, or to perform any other really great splitting chore.

In terms of specimens found, power tools are not efficient. [We do not, by the way, blame our lack of pre-1800 specimens solely on the huge equipment in use, but we do think it likely hand excavation might have revealed some.] It is not that heavy excavating equipment does not bring objects to light, for at Fort Pitt it brought thousands to view, but it does not permit viewing with deliberateness or ease. The man who uses power tools at a site must be content to know he is probably losing some specimens.

With such equipment as bulldozer, Gradall, and Hi-Lift, it is theoretically possible to have individual loads deposited in planned patterns in order that they might be screened and checked by hand. The theory breaks down in the face of reality unless the investigator is furnished with immense amounts of assistance in terms of men who can screen and check. At Fort Pitt eighty thousand cubic yards of earth were moved. Each yard was destined for a particular area of the site for use as fill for a road-bed, and it had to get there with dispatch in order that the contractor might remain in business. The cost for slowing the transfer of eighty thousand cubic yards in order that it might be screened would have been prohibitive.

The investigator must be content with sketchy provenience records on any specimens he sees and wishes to keep. Unless the object has luckily been untouched by buckets, treads, tires, teeth, and claws, but only cleaned off and revealed, the investigator will be lucky to get within several feet in his provenience record. And this is true only if he is deliberately following one particular load. If he be, for instance, at a fill area and sees an object dumped, his provenience reading can be only something like this: "From NW portion of area being cleared between Penn Avenue and Duquesne Way on 7 May, 1954." *That* might get him within five feet in a vertical reading, but he'll be lucky if he's within eighty in a horizontal. Most heavy equipment is just too massive in its action to give the sort of provenience record we desire and get from carefully hand-excavated American Indian sites.

The weight of power machinery destroys some specimens. It is true that a remarkably thin layer of earth over even a fragile specimen may save it. At the Johnston Site (CM 36In2) near Blairsville, Pa. (6), a Carnegie Museum party reported the treads of a bulldozer being used to clear over-burden had passed not more than an inch above a skeleton, and the skeleton was hardly disturbed. I think, however, that had they been using such a monster as the Caterpillar D6 with which Welfer found the south wall of Fort Pitt, they would have found their skeleton crushed. Bulldozers and other tracked vehicles, by virtue of their weight, have a tendency to grind and swerve at soft spots, and at such times they gouge untidy trenches and would doubtless crush anything they hit of the nature of wood, pottery, or bone.

In terms of locating features of size, the bulldozer and Hi-lift are good tools. The latter is particularly good since it is light and can lift its load straight up instead of pushing it forward and piling dirt over the next area to be cleared. The other digging tools, the power shovel, the clam-shell bucket, the Gradall, are not, generally speaking, useful for locating features although they are helpful in clearing overburden. Where, as was true at the Point State Park and at the Johnston Site, the archeologist is aware of the location and kinds of features likely to be met, and the purpose of power tools is to clear the site rapidly to the feature level, power tools are excellent. Small bulldozers should be very useful at jobs of this nature with Indian sites since their light weight insures minimum damage yet their strength is sufficient to clear all but heavy clay or rock soils.

For back-filling, there is no question as to the worth of power tools. If there is an excavation to be filled in, and if it is financially feasible, hire a bulldozer or a Hi-lift. Don't hesitate.

In terms of price, power tools are very efficient. The excavation at the south wall of Fort Pitt cost $165 for use of bulldozer, motor crane with clam-shell bucket, and Gradall, total time of eleven hours. With the aid of the Commonwealth's Resident Inspector at the Point State Park, we figured the price and time to do the south wall job by hand. Reckoned on the movement of three yards of earth per day per man, the day being eight hours, the pay being union rates for Allegheny County, we came up with a figure in the neighborhood of $5200 in money, 342 in man-days.

I think there is no doubt that some kinds of power tools can be very useful to archeologists on some American Indian sites. I believe the use of excavating machinery must be based on the following questions:

1. What is the purpose of the excavation?
2. How much is known of the site to be excavated?
3. How much time is available to perform the excavation?
4. Is the site to be rendered inaccessible by some construction feature or natural disturbance?
5. How much money is available for hire of power tools?

Procedure to be followed in using power tools at a site is this:

1. The site must be test-pitted and a reasonably reliable estimate based on a test-pit graph be formed of the contour of the culture level.
2. The operator of the equipment must be thoroughly briefed as to the archeologist's desires and should have as much information as possible about sub-surface conditions as determined by test-pitting.
3. The archeologist must work directly with the operator while the machinery is in operation in order to assess materials and features being exposed and to stop the machinery's work when necessary.

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The Linn Mound, An Upper Ohio Valley Adena Stone Mound

By

Don W. Dragoo*

One of the most interesting problems in Ohio Valley archaeology is the cultural affinity of the stone mounds. These small burial mounds of stone slabs and earth found on the high terrace and hill tops are known to have a wide distribution and were often mentioned in the early archaeological surveys (Squier and Davis, 1847; Thomas, 1894). These mounds, however, were seldom studied by early scientific investigators because they yielded so few artifacts. Nearly all organized investigations were focused on large productive mounds, while the small stone mounds were looted and destroyed by collectors and curiosity seekers. As a consequence, only a few of these mounds are known in any detail.

Early in September, 1933, Reinhold Fricke of Carnegie Museum and George S. Fisher of Finleyville, Pennsylvania, accompanied by John Oshinsky of Library and Frank Grelo of Elrama, excavated most of a stone mound on the Linn brothers farm approximately one mile southeast of the Hill Church in North Strabane Township, Washington County, Pennsylvania (Botsfords, 1933). The materials removed from the mound along with notes, photographs and maps made by Fisher were deposited at Carnegie Museum. When these were recently taken out of storage, I considered them important and felt they should be made known to my colleagues. This paper is the result of a study of the materials deposited in the Museum and personal observations of the mound as it stands today. For additional notes and information concerning the mound, I am especially indebted to Mr. and Mrs. Robert S. Mellon of Pittsburgh, who were present at the excavations in 1933.

The Linn mound was located on a ridge between two hill tops at an elevation of nearly 1,100 feet above mean sea level. The south hill top, from which the surrounding country can be seen for miles, is much higher than the north. Several excellent springs are in the immediate area and a small branch of Little Chartiers Creek flows in the valley south of the mound.

The mound was about 30 feet in diameter with a maximum height of 33 inches. Most of the mound fill was large slabs of a fine-grained brownish sandstone removed from a nearby outcropping. Mixed in among the sandstone slabs were small stones gathered from the surrounding area and earth removed immediately adjacent to the mound. Some of this earth may have been removed from a basin-shaped depression near the southwestern margin of the mound. Fisher comments that the structure was "more of a stone pile than a mound."

This mound apparently had not been disturbed by cultivation before the excavations in 1933. However, it had suffered several indiscriminate excavations. About the year 1870 a large area on the southeast side of the mound was destroyed. Fisher found a number of small disturbances throughout the mound.

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The excavators divided the mound area into blocks five feet square by driving rows of stakes numbered from west to east, with the first row on the north side of the mound. These stakes were placed only to the margins of the mound. All burials and objects found in the mound were recorded by reference to the nearest stakes. The mound was not excavated by arbitrary levels and no vertical measurements for any of the finds were found among the notes. Fisher did mention, however, that the burials occurred on several levels, and the relative position of one burial to another or to the floor of the mound was often noted.

Most of the information concerning the structure of the mound and the pattern of excavation was found in Fisher's notes pertaining to the burials. In the following paragraphs this information is summarized. Figure 1 shows the location of all known features in the mound.

Excavations and Burials

Excavation began at stake 3 and continued southeast, taking out stakes 7, 8, 9, 15 and 16. Near the margin of the mound at stake 3 a few small field stones were encountered, but upon approaching stakes 8 and 9, large sandstone slabs were found. Fisher's notes say some of these stones would have weighed 100 pounds, and almost all of them were turned on edge.

Between stakes 8 and 15 the remains of Burial 1 were uncovered. The bones of Burial 2 were encountered at stake 16. Both of these burials were in an extremely bad state of preservation and none of the bones were saved. The teeth of both were of adults and were almost half worn away. There was no evidence of dental caries, however. Between these two burials, at stake 15 and continuing east for 3 feet, was a group of well-placed stone slabs resting directly on the base of the mound. Charcoal was found under all these stones and in the immediate area. Mixed in among the pieces of charcoal were a few flakes of bluish flint.

While we have no detailed information on Burials 3 and 4, Fisher's map indicates that Burial 3 was found northeast of stake 22 and Burial 4 between stakes 21 and 29.

In several general observations on the first four burials, Fisher makes it quite clear that all four were poorly preserved, and it was impossible to measure or determine their position. He also comments that all these burials were laid on a slab or slabs of stone. He found a few examples of several large slabs that had apparently been put together to form a gable, which was braced by smaller stones placed outside and around them. Nothing was recovered from these gables, but Fisher believed at the time that they contained burials of children.

The area from stakes 22-25 to 30-33 had been disturbed by a trench dug from east to west by unknown persons about 1870. Fisher and his crew went into this area only far enough to determine that all materials had apparently been destroyed. He then turned his attention to the area immediately west and south of this ravaged section.

Between stakes 20 and 28 a hole had been dug by some local boys. When Fisher's crew cleared this area and reached the bottom of the pit, they found Burial 5. This burial may have been flexed, as indicated by the position of the femur and part of the tibia, but the bones were too decomposed to signify positively such a placement. In contrast to the first four burials, some of these bones were so charred by fire that they were black and "glistened as though they had been polished." The stones around this area showed considerable evidence of fire and in several places there were many large pieces of charcoal.

Burial 6 was found just east of stake 28. These bones showed some traces of fire but much less than those of Burial 5. Animal bones (reported to be bear) and several animal teeth were found among the human bones. Information concerning the condition and position of the skeleton apparently was not recorded. Fisher's notes and his map do not agree in the location of Burial 6 and Burial 12. Their placement could have been reversed from the one given here.

Burial 7, located immediately south of stake 35, was of considerable interest to the excavators since it was the first disarticulated burial found in the mound. It was only 8 inches under the surface and was covered with much smaller stones than usual. These stones were apparently gathered from the nearby fields. The bones were all out of order and scattered over an area of 36 by 18 inches. Many of the bones showed marks of intense fire, although there was little charcoal. The body had been partly cremated and the bones then gathered together and taken to their final resting place in the top of the mound.

Burial 8 was found about 3 inches below and directly under Burial 7. The body had been extended with the head towards the west. Burial 9 was discovered immediately under Burial 8 and was extended with the head towards the south. One had been laid across the other at about the region of the lumbar vertebrae. Several large slabs of stone covering these two burials had so crushed and broken the bones that no measurements or other information concerning the skeletons were recorded. Several small chips of a dark flint were found near the bones. Both skeletons were then removed in a mass of earth. When this mass of earth had been washed away the excavators found 3 small side-notched points, 1 small corner-notched point, 1 stemmed point, 1 broken point tip, 8 side scrapers, 1 bone awl and 1 tooth. These were the first objects associated with a burial found by Fisher's crew.

Burial 10 was found near stake 36. The skeleton was apparently of an adult male in fair preservation since it had not been crushed by heavy stones. It had been extended on its left side directly on the floor of the mound with the head and feet resting on large slabs. The head was turned on the right side with the mandible pulled down and backwards until it rested on the base of the cranium. A small side-notched point and a bone bead were found with this burial. The head had been burned.

Burial 11 had been so completely crushed by the stones protecting Burial 10 that little information was recorded. The bones were found scattered among the stones northwest of Burial 10. It is quite possible that this skeleton was disarticulated at the time of interment.

Burial 12, an adult male, was discovered in removing several large slabs near stake 40. The bones were fairly well preserved and gave some indication of the body's position at burial. The body had been loosely extended on its left side with one arm along the body and the other arm flexed with the hand in front of the face. Near the chest, a considerable amount of charcoal was found and the bones showed heavy traces of fire.

Burial 13 was found near the edge of the mound just east of stake 34. The bones were badly crushed from the weight of several large slabs covering the body as well as some on the outer margin of the mound. These marginal stones had been reinforced by smaller stones from the nearby fields.

Burial 14 was located near stake 19 but there was very little information recorded about its position or condition. Considerable evidence of fire was found at stake 27 and near stake 19. Many large slabs were found in the area near and around the bones. Some of these stones were described as "pyramids" or "A's" and probably resulted from the collapse of the stone vaults around the burial.

Burial 15 was found between stakes 20 and 21. The bones were so poorly preserved that little information was recorded.

Burial 16 was found between stakes 13 and 22. It was badly preserved and no information is present about the arrangement of the bones. Charcoal was found scattered among them, and a large quantity of "red ochre" stained the stones and surrounding earth.

Burial 17, discovered near Stake 11, was so poorly preserved as to give no definite information as to skeletal disposition.

Burial 18, between stakes 12 and 20, was extended on its back near the floor of the mound. The bones were poorly preserved. They showed no traces of fire and there was very little charcoal in the area. Several small stones had been laid around the body, and then larger ones had been placed on top of them.

Burial 19 was uncovered near stake 13. It was extended on its back with the head towards the northeast. The bones were badly decayed.

Burial 20, between stakes 12 and 20, was so crushed and twisted as to present the appearance of a disarticulated skeleton. This may have resulted from the settling of the slabs. No trace of charcoal was found around the bones but on the floor of the mound directly below the burial both ash and charcoal were noted.

Burial 21 was a few inches above the floor of the mound near stakes 7 and 14. The bones were quite scattered and gave the appearance of a disarticulated burial. Very little charcoal was found among the bones but the excavators believed the burial was at a fire place "as the clay was red [burned] for a depth of 3 inches."

Three main type of burials were definitely represented in the Linn Mound—extended, disarticulated and partial cremations. Although not specifically stated in the notes, it was implied that some of the burials were flexed and that full cremations were also represented.

Data concerning the location and burial association of cultural material found in the mound are far from complete. Specific references to materials associated with burials were found only in the notes describing Burials 8, 9, and 10. On a rough map included among the notes, artifacts were indicated as having been found near Burials 4, 7, 8, and 11.

None of the skeletal material removed from the mound and now at Carnegie Museum is sufficiently preserved for measurements; therefore, it is impossible to determine the physical type or make any comparisons with skeletal materials from other stone mounds in the Ohio Valley.

Mound Structure

The mound was evidently built by the accumulation of burials surrounded and covered with large sandstone slabs. Smaller stones were used to brace the large slabs around the burials and near the margin of the mound.

The soil underlying the mound was clay. On this level near the center of the mound at stake 21, fires had apparently been built a great many times because there were large amounts of charcoal and ash and some depth of burned clay. The presence of fires was noted for other areas in the mound but nowhere did they appear as intense as at the center. All fires were on the floor level of the mound which may possibly represent a former habitation site.

Artifacts

There are some very interesting objects from the Linn Mound in the collection at Carnegie Museum. Unfortunately, there was very little information recorded concerning the provenience of these objects in the mound. Fisher remarks that "artifacts were extremely scarce and in poor condition in this mound." As much of Fisher's previous work had been in highly productive sites of the Late Prehistoric Monongahela Culture, he was evidently not impressed with the few but important objects found in the mound.

There were 6 whole projectile points and 1 broken one found in the excavations. Five of these points were found with Burials 8 and 9 (Plate I, Nos. 1-5) while 1 was found with Burial 10 (Plate I, No. 8). The remaining point (Plate I, No. 9) is from an unknown location in the mound. Six of these points are of varieties of Flint Ridge chalcedony while the material of the other 2 points is unknown. Of these points 4 are side-notched, 2 are stemmed, and 1 may have been corner-notched. The small broken point which may have been corner-notched (Plate I, No. 3) shows evidence of having been in a fire.

There were 10 scrapers removed from the mound, 9 of which were reported found with Burials 8 and 9. All are quite crude and are of the variety most commonly called side-scrapers. Three of these are similar to flake knives but are more crudely fashioned. Flint Ridge chalcedony and local pebble flint were among the materials used to make these tools. (Plate I, Nos. 10-13)

According to the notes a number of pitted stones were found among the slabs of the mound. One such stone in the collection at the Museum has two pits each about 1 inch in diameter by ½ inch in depth. Another large stone in the collection has a depression on one face which shows that it was probably used as a mortar.

The only bone tool known from the mound is a small awl about 2½ inches long found with Burials 8 and 9. A woodchuck incisor was also found with these two burials. (Plate I, Nos. 6 and 7)

DISCUSSION

Various types of stone burial structures are known to exist in Pennsylvania, Ohio, Indiana, West Virginia, New York, Kentucky, Tennessee, and in a number of other states. While some of these stone structures are the product of the same cultural tradition, there are marked time differences among them. Some are so very different in construction as to be only remotely related.

Not to be confused with stone structures like the Linn Mound, are the small stone covered and lined burial vaults. In southwestern Pennsylvania many of these have been reported, apparently belonging to the Late Prehistoric Monongahela Culture (Engberg 1930, pp. 75-85: Butler 1939, p. 64: Dragoo n.d. Johnston Site). Many of these stone graves were associated with the burial of children. Setzler (1930, pp. 502-505) reported the excavation of a similar stone structure of comparable age in southern Indiana.

Excluding the stone graves of the Late Prehistoric period, the stone mounds of the Ohio Valley and surrounding areas may be divided into two main groups according to whether they have been considered as belonging to Early or Middle Woodland times and more specifically as to whether they are Adena or Hopewell. The Hopewell mounds are somewhat better known than those of the Early Woodland period. Although many Early Woodland stone mounds are believed to be culturally related to Adena, only a few have cautiously suggested them as an important phase of Adena culture. In Webb and Snow's (1945) monumental synthesis of the Adena culture there is no mention of the stone mounds as being related to

Adena even though they shared nearly identical areas and traits. Adena has been almost entirely defined on the basis of large earth mounds while the small stone mounds bearing similar traits are usually thrown into file 13, Early Woodland. In the paragraphs that follow, I have attempted to show the relationship of the Linn Mound to the Early Woodland and Hopewellian stone mounds of Pennsylvania and the Ohio Valley, and in turn their place in the Adena-Hopewell cultural picture.

The most detailed description of a stone structure similar to the Linn Mound in southwestern Pennsylvania was Cadzow's (1933, p. 3) account of George S. Fisher's excavations of the Pollock's Hill Mound. This mound was on a high hill overlooking the Monongahela River 3½ miles east of Finleyville, Washington County, and only a few miles east of the Linn Mound. The construction of the mound and the associated burials and artifacts were in most details identical with those known for the Linn Mound. These traits are listed on Table I.

Thomas (1894, pp. 496-499) described a number of mounds in the Monongahela Valley, particularly around Monongahela City and Belle Vernon, Pennsylvania. Since most of these had been looted of their contents, very little was discovered about their cultural affinity. They were constructed mainly of stone and located in groups on top of the bluffs overlooking the river and surrounding country. While most of these mounds were small, a few mounds were reported to have been 50 feet or more in diameter and several feet high.

A number of stone mounds have been reported on the hill tops along the Cheat River in West Virginia (Hayden, 1941, pp. 5-7). While it seems evident from the available information that structures of different time periods were found, many of these stone mounds are quite similar to the Linn Mound in construction and contents. One such mound recently visited by the author was undoubtedly of this type.

One of the best sources of information on stone structures similar to the Linn Mound in the Ohio Valley is a report by Black (1934, pp. 231-243) of the excavations of two such mounds on the Burkam farm in Dearborn County, Indiana. Both resemble the early Pennsylvania stone mounds in choice of location, construction, and contents. The traits of the Burkam stone mounds are listed in Table I.

In 1952 a rather large stone mound in Shelby County, Indiana (Dragoo 1951, p. 13) was excavated by Glenn A. Black and James Kellar. The relationship of this mound to the Adena complex and the other stone mounds of the Ohio Valley was clearly demonstrated in Kellar's preliminary report of this mound at the 1953 meeting of the Society for American Archaeology in Urbana, Illinois.

Funkhouser and Webb (1937, pp. 173-206) have reported on the excavation of a stone mound (Chilton Site) in Henry County, Kentucky, which they believed to be much like the Burkam mounds in Indiana. In their summary they ably state the difficult problem facing the student of the stone mound:

"The information gained from this exploration seems not sufficient to determine definitely the cultural connection of this site. It may be said, however, that the trait complex corresponds most nearly to that found in low stone mounds which are known to be widely distributed in Kentucky, Ohio, West Virginia, Pennsylvania, New York, Tennessee, and Indiana. These stone mounds usually occur on the top of high ridges and being conspicuous objects, have attracted the attention of 'pot hunters' to such an extent that most of them have been completely destroyed. The size of these mounds, low, circular structures of flat slabs, renders their destruction easy, and due to their composition, the preservation of the skeletal material is very poor. For these reasons, this culture group has received but little attention, and in comparison to its widespread occurrence, has been but little studied."

In Table I, I have attempted to compile a tentative trait list for the stone mounds of the Ohio Valley from the traits as known from the Linn and Pollock's Hill mounds in Pennsylvania, the Burkam mounds in Indiana, and the Chilton site in Kentucky. These sites were chosen because of the quantity of information available for each site. Some traits not listed here occur in many other sites, apparently of the same cultural complex, mentioned in the literature on Ohio Valley archaeology. However, the data on these sites are too scanty to make their identification positive.

TABLE I

Some Ohio Valley Stone Mound Traits

A. Linn Mound B. Pollock's Hill
C. Burkam Mounds D. Chilton Site
E. Adena

Burial Traits	A	B	C	D	E
1. On hilltop or high ground	x	x	x	x	x
2. Low mound of slabs	x	x	x	x	?
3. Fragmentary burials	x	x	x	x	x
4. Partial flesh burial	?	?	x	x	x
5. Cremation	x	x	x		x
6. Bundle reburial	x		x	x	x
7. Extended burial	x	x		x	x
8. Flexed burial	x	x		?	?
9. Multiple burials	x	x	x	x	x
10. Central, prepared burial cist	?		x		x
11. Subfloor burial cist			x	x	x
12. Burial cist on floor	x	x	x		x
13. Partial flesh burial around cist			x		x
14. Artifacts not common	x	x	x	x	x
15. Red ochre with burials	?				x
Artifact Traits					
Bone					
16. Fishhook		x			
17. Bone awl	x		x		x
18. Cut animal jaw			x	x	x
19. Rectangular, two-hole gorgets			x	x	?
20. Antler ornament (pendant)			x		?
21. Elk incisors, drilled				x	
22. Bear canine, perforated		x		x	
23. Animal teeth	x	x		x	x
24. Animal claws			x		x
25. Animal bones	x		x	x	x
Flint					
26. Stemmed projectile points	x	x	x	x	x
27. Notched projectile points	x	x	x		x
28. Leaf-shaped blade			x		x
29. Triangular blade with convex edges			x		x
30. Drills, expanded base	?				x
31. Scrapers	x				x
Stone					
32. Grooved axe			x		
33. Celt, round poll				x	x
34. Celt, rectangular poll		x			x
35. Celt, chipped argillite			x		?
36. Hammerstones	?		x	x	x
37. Pitted stone	x				x
38. Stone mortar	x	x			?
39. Gorget, rectangular, two-hole, slate			x	x	x
40. Elbow pipe				x	x
Metal					
41. Copper beads, rolled		x			x
42. Copper fragment				x	x
43. Galena fragment				x	x
Pottery					
44. Grit-tempered, cord-marked			x		x
Miscellaneous Traits					
45. Fire pits on mound floor	x	x	x		x

46. Charcoal in mound	x	x	x	x	x
47. Mutilated artifacts with cremations	x				x
	21	19	29	23	37

In the right-hand columns of this chart the traits found at each site are indicated by an x. A "?" is used where the literature of a particular site suggests the presence of a trait but does not offer sufficient evidence for positive identification. The last column shows traits that also appear in Webb and Snow's (1945) Adena trait list.

The Linn Mound possesses 21 of the 47 traits in the list while the Burkam Mounds possess 29 traits. The Chilton Site and Pollock's Hill Mound have 23 and 19 traits respectively. The Linn Mound shares 15 traits with Pollock's Hill, 14 with the Burkam Mounds, 12 with the Chilton Site, and 18 with Adena. There are 37 Adena Complex traits on the stone mound list. If the suggested traits marked by the "?" in Table I were used in the comparisons, the stone mounds and Adena would appear even more closely related.

Large earth mounds identified as Adena are known in all of the main areas where stone structures of the Linn Mound type have been reported. In the Upper Ohio Valley there are a number of these mounds for which there is considerable information. Important among these are the Crall Mound (Thomas 1894, pp. 494-496; Webb and Snow 1945, pp. 58-59, 101), McKees Rocks Mound (Carpenter 1951, pp. 330-340), Grave Creek and Beech Bottom Mounds (Bache and Satterthwaite 1930), and the Natrium Mound (Solecki 1953). Carpenter (1951, pp. 340-343) has also briefly reported upon the Darlington, Oakmont, Mapleton, Mahoning River, and Sheppler Mounds which show affinities with Adena.

In his discussion of the McKees Rocks Mound Carpenter (1951, p. 346) cautiously classified it as "very early Hopewell with residual vestiges of the older manifestation [Adena]." This author, having also examined the materials and notes from the McKees Rocks Mound, would consider it basically Adena with intrusive Hopewellian features. Carpenter's remark (1951, p. 346) "that the differentiation between Adena and Hopewell, particularly in peripheral areas, is not nearly so great as a comparison of their focal centers" echoes the opinion of most students of Adena-Hopewell.

The disposal of human remains as manifested by the Linn and other stone mounds is well known for Adena. In some of the Adena earth mounds, stone cists or tombs have been discovered around burials as well as the common log structure. In Pennsylvania, stone cists have been reported by Carpenter (1951, pp. 337, 341) in the McKees Rocks and Darlington mounds. Webb and Snow (1945, p. 43) list the use of stone for cists and other structures as trait number 24 in their Adena trait list and name (p. 17) four sites in Kentucky and one in Ohio where it was found.

The second main division of stone mounds in the Upper Ohio Valley consist of those considered by their excavators to be of Hopewellian origin. Several mounds with large quantities of stone slabs used in their construction are known from the Allegheny Valley (Carpenter, n.d.). These mounds were grouped into the Thomas Focus by Schmitt (1952, p. 61) and a trait list based on twenty-four of these mounds was compiled by Mayer-Oakes (n.d.). Most typical of these mounds are the Irvine and Sugar Run mounds in Warren County, Pennsylvania (Bliss 1942, pp. 35-38). The Squawki Hill Mound 2 and the Geneseo Mound of Ritchies' (1944) New York Focus resemble the mounds of the Thomas Focus in all major features and should be considered as closely related. During the summer of 1953 a stone mound indicative of the Hopewellian period was excavated by the author at the Watson Site along the Ohio River in Hancock County, West Virginia.

In contrast to the stone mounds as represented by the Linn Mound which are generally on high hills commanding a wide view, these mounds of the Hopewellian or Middle Woodland time period are usually located on flat terraces immediately above the rivers and are often associated with extensive village sites. This important difference, together with the presence of curved-base platform pipes, copper-covered ornaments, mica, gorgets, galena, and Middle Woodland pottery, certainly indicates a significant cultural advancement in which agriculture was undoubtedly the guiding force. The structure of these mounds and the disposition of the burials within them conform in all essentials with those of the Linn Mound type which are considered by this author as Adena and thus ancestral to them.

The scarcity of detailed reports makes it impossible at present to arrange in time sequence the mounds here discussed as belonging to Adena or Hopewell. Just as Webb and Snow (1945) have demonstrated important time differences among the large earth mounds of Adena and Hopewell, future work should demonstrate the same situation for the stone mounds. While some mounds such as the McKees Rocks Mound are Late Adena, it is of particular interest to note that in the Upper Ohio Valley Hopewell appears to be represented chiefly by stone mounds of the Thomas Focus type.

Summary

(1) Stone mounds of the Ohio Valley such as the Linn Mound, which are found on hilltops and share burial and artifact traits with the Adena complex, should be recognized as Adena just as well as the larger earth mounds.

(2) Stone mounds are a less sophisticated version of the larger Adena earth mound. Although the stone mounds share the same general areas as the earth mounds, they are more often located on hills near tributaries of large streams. These mounds seem to represent the burial complex of Adena's country folk. The way of life of many of these hill people was quite similar to that of the Late Archaic peoples who preceded the Adena in the Ohio Valley and who undoubtedly were partially absorbed by these newcomers with their strange and complex mound burial practices.

(3) Stone mounds were constructed over a long span of time in the Ohio Valley. Just as the Linn Mound is Adena, there are others that belong to the later Hopewellian period. The use of stones to surround and cover burials appears to have been partially taken over by Late Prehistoric peoples and continues long after Hopewell ceased to be a powerful influence in the Ohio Valley.

(4) The stone and earth mounds of Adena and Hopewell represent the material expression of a powerful socio-religious complex focused around the dead. This complex was able to transcend varying economic situations and physical differences between people for a period of 2000 years or more.

This article does not claim to be the definitive word on the stone mounds. The intent has been to point out the many interesting ramifications involved in their study, with the hope that other archaeologists will become cognizant of their importance in the understanding of Adena and Hopewell culture.

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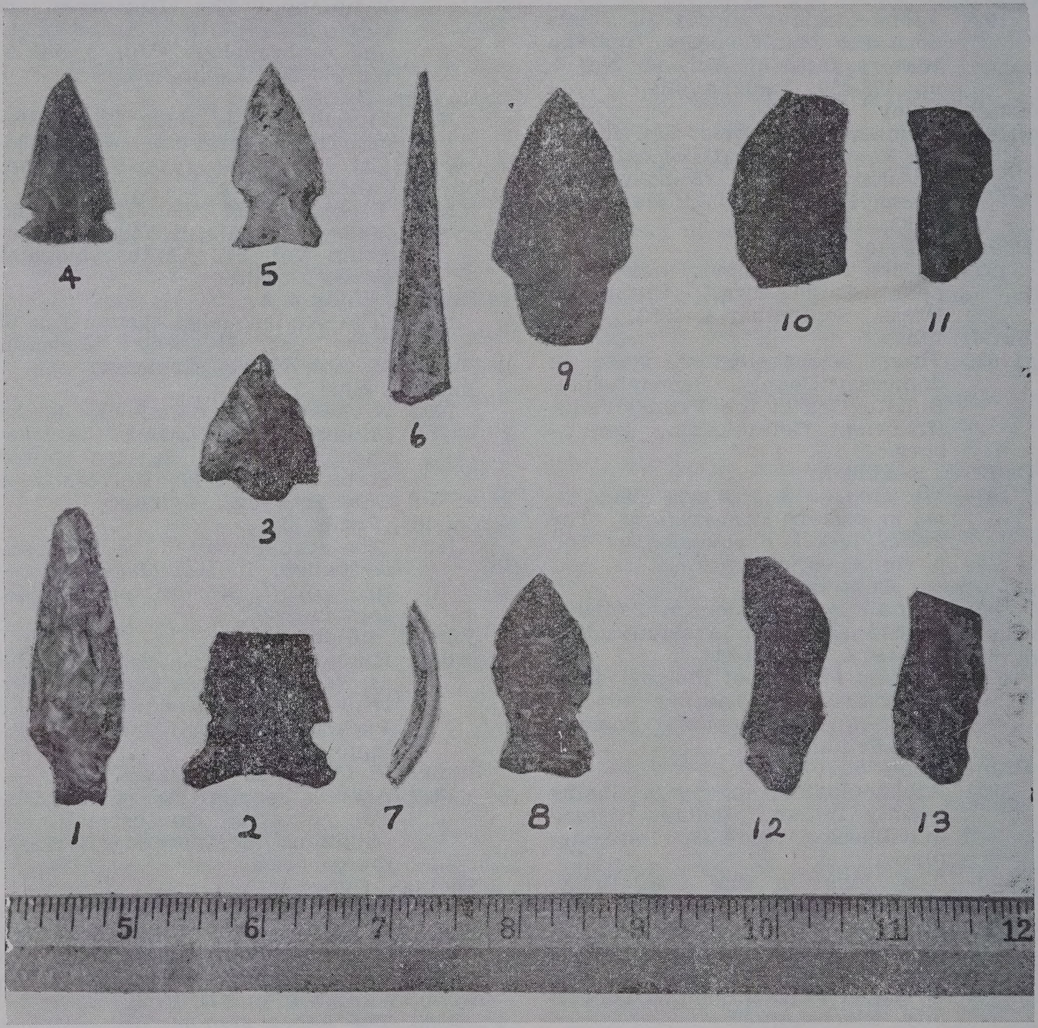
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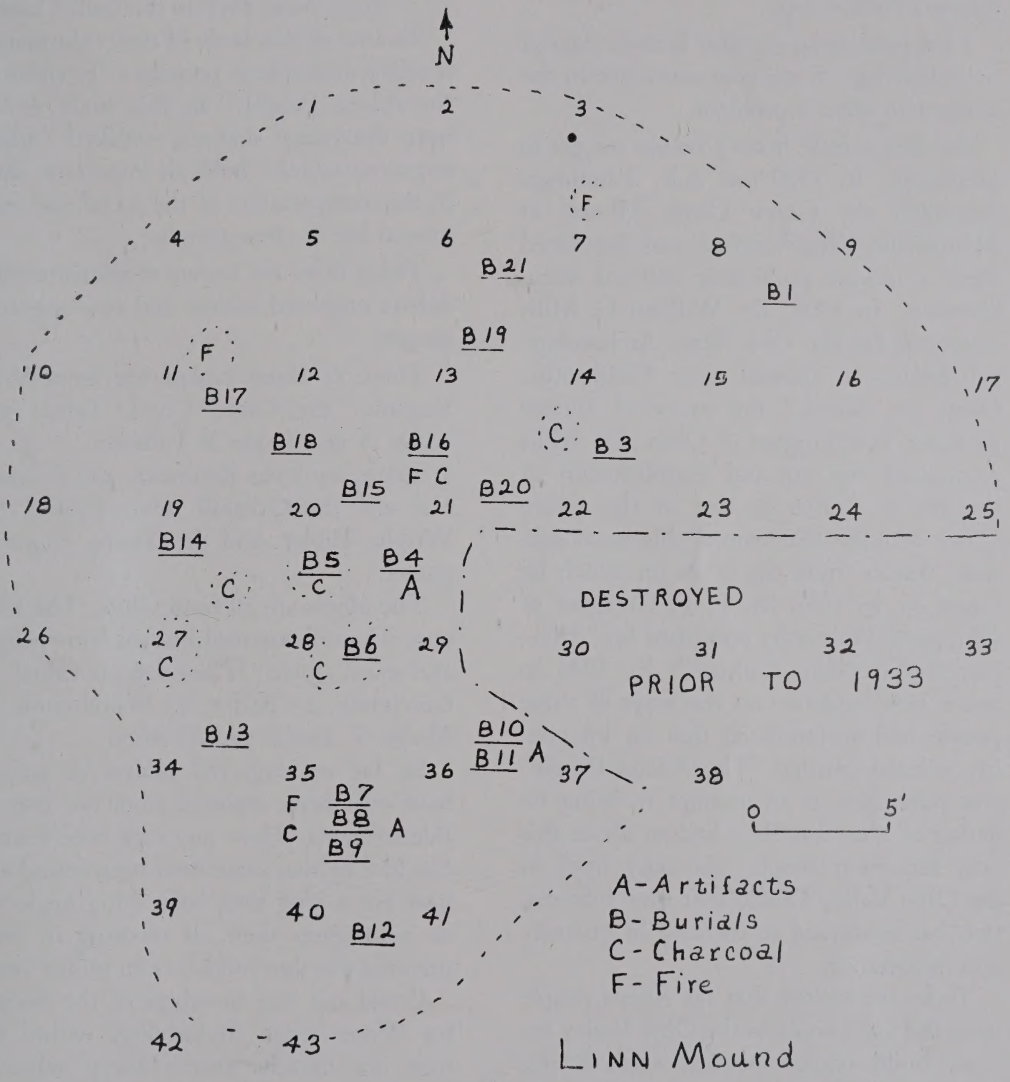
Plate I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B7
B8
B9
A
A-Artifacts
B-Burials
C-Charcoal
F-Fire
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40
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B12
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43
LINN Mound

NOTE—B 2 should appear just above the figure 16 on the map.

Figure I. Approximate location of various features found in the Linn Mound as recorded in Fisher's notes and maps.

A Request For Help

By

William S. Webb*

To the members of the Society for Pennsylvania Archaeology:

I am presuming on your known interest in archaeology to ask your assistance in the attempt to solve a problem.

But first a little *history* before we get to prehistory. In 1938 one A.B. Tomlinson excavated the Grave Creek Mound at Moundville, West Virginia, and discovered there a unique prehistoric cultural manifestation. In 1902, Dr. William C. Mills excavated for the Ohio State Archaeological Society a mound near Chillicothe, Ohio, at "Adena," the estate of former governor Worthington of Ohio. Dr. Mills recognized the cultural manifestation at the site as similar to that at the Grave Creek Mound, and named this manifestation "Adena" from the estate on which he found it. In 1932 Dr. E. F. Greeman of Ohio State University published his "Analysis of the Adena Culture." By 1945 so much new evidence on the ways of these people had accumulated that an integrating volume entitled "The Adena People" was published in an attempt to bring together all that was then known about this very important people who once lived in the Ohio Valley. Since that time information has continued to increase in quantity and importance.

Today we believe that the Adena people were the first people in the Ohio Valley to:

a) build non-geometrical earth works;
b) to practice rudimentary agriculture and begin plant domestication;
c) to bury their dead in earth mounds;
d) to make and use grit tempered pottery for cooking of food;
e) because of their proven antiquity and highly developed cultural patterns they made very important cultural contribution to the prehistory of the eastern portion of the United States from New York to the Gulf Coast.

Because of this body of new information it seems desirable to prepare a "Revision of the Adena People." In this study, it has been discovered that the so-called "Adena engraved tablets" hold an important place in the interpretation of the social and ceremonial life of these people.

Today there are known to science twelve Adena engraved tablets and two engraved gorgets.

Three of these tablets are from West Virginia: the Grave Creek Tablet and Lakin A and Lakin B Tablets.

Three are from Kentucky, the Gaitskill clay and the Gaitskill stone Tablets, the Wright Tablet, and the Young engraved gorget.

The others are all from Ohio: The Florence Mound engraved human bone gorget, and seven tablets: These last are called, 1) Cincinnati, 2) Berlin, 3) Wilmington, 4) Meigs, 5) Kiefer and 6) Allen.

So far no engraved tablets or gorgets have ever been reported from the state of Pennsylvania. Have any ever been found? Could it be that some *have* been found and have for a long time been lying neglected on a museum shelf, or reposing in some private collection hidden from public view?

Could not you members of the Society for Pennsylvania Archaeology within the next six months search every museum available to you and scan the collections of all collectors of Indian relics for unreported engraved stone or clay tablets, or engraved shell gorgets? If any are found, report them to the undersigned or to Mr. Raymond S. Baby, Ohio State Museum, Columbus. If any such artifacts can be brought to light it would be a real service to archaeology, and might enable a very considerable advance to be made in the present interpretation of known evidence.

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*Dr. William S. Webb, Professor Emeritus, The University of Kentucky, Lexington, Ky.

We would appreciate your efforts in the search even if we find nothing new.

Looking For Artifacts-Part 6

BY

VINCENT R. MROZOSKI*

F. Excavation of Artifacts

All artifacts should be treated as fragile, and direct contact with excavating tools should be avoided. They should be removed by such methods as brushing, lifting, etc., seldom by scraping. Whenever possible, an artifact should be excavated in situ, and never extracted until completely exposed. Breakage may result from pulling or prying. Extreme care should be given such artifacts as bone, shell, antler, and pot sherds when wet, to prevent disintegration. Whenever practical, these specimens should be placed in a container or jar to preserve their moisture. The pot sherds can be placed in a box padded with newspaper and tissue, with special care needed in packing to prevent damage to the edges. I have seen advanced amateurs use Mason jars for charcoal samples which is a very good idea. These can be labeled ahead of time and when needed, the site number, fire pit, level, etc., can be written in. Delicate specimens should be given a thin coat of celluloid, Alvar or Ambroid. The Alvar and Ambroid can be sprayed on delicate bone specimens with an atomizer once they are cleaned of loose dirt. The Ambroid should be sufficiently thin; it can be diluted with acetone. Saturating a bone specimen solidifies it. When it is dry, very carefully turn it over and give it another coating. Bone in a fragile condition should be cleared of dirt in situ, then saturated with acetone and with a thin solution of Alvar and acetone. It may be necessary to coat deteriorating specimens with two or three coats to preserve them.

Perhaps it is best that I list some of the materials which are used in the preservation of brittle and damp bone specimens. These preservation techniques will include human and animal remains and bone artifacts.

(1) Shellac and alcohol—A pure white shellac should be used. Do not obtain the orange or compound shellac. Shellac should be thinned with alcohol, using a one-half to two-thirds mixture. A half-inch brush is probably the most useful tool for applying the shellac. This mixture can be brushed or sprayed on your specimen and will harden it.

(2) Alvar—This product is soluble with acetone and will solidify bone specimens; it must be thin enough to spray with an atomizer.

(3) Duco—This adhesive product is available in tubes and is handy for small repairs. Another similar product is Ambroid which is a little more expensive. It has a yellowish color which is somewhat objectionable.

(4) Celluloid and acetone—This mixture may be carried in a stock solution and may be thinned with acetone at any time if need be. It is useful as an adhesive and can be used in thin coats to harden specimens. Wet artifacts of antler should be dried slowly, then coated with a thin solution of celluloid. Poor specimens should be saturated with a thin solution. Repeat if necessary. Artifacts of shell in a delicate or crumbling condition should be given a soaking in this solution after the removal of loose dirt. Objects of metal such as iron and copper, once dry, can also be given a thin solution to prevent disintegration. The oxidized surface of corroded metals should be preserved because

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of the valuable information it may give.

(5) Plaster of Paris—There are several grades of this product and the "slow set" is recommended because it is most easily handled. This is mixed with water and is useful in jacketing specimens and burials that are in a delicate condition.

(6) Hot Parafine—This can be used and scraped off later.

(7) Beeswax and Benzine—The beeswax is dissolved with either benzine or gasoline, and is used for coating wet specimens. Extreme safety precautions should be practiced here in order to prevent accidents. No smoking.

(8) Plastic Spray—A bomb-type plastic spray now on the market can be used for the preservation of certain specimens.

If it is necessary to clean an object to see if it had been worked, position should be noted before it is removed. The positions of all exposed artifacts should be recorded. This information is as important as the artifacts themselves. An adequate analysis of an excavation cannot be made unless each artifact can be accurately placed in relation to other cultural remains. Evidence of the extent of cultural change during the occupation of a site is provided when the horizontal locations reveal a clustering of certain artifacts in a particular area. Good judgment on your part should determine which artifacts are not of sufficient importance to warrant exact location. Objects of common occurrence can be placed in the level bag which will provide the necessary information as to the unit and depth. Such fragments as broken projectile points, pot sherds, etc., can also be placed in the level bag. Your level bags, (paper sacks), should always list the site number, date, depth and unit number. Jot down the necessary information immediately before going down another level. Usually the six-inch interval between levels is considered standard unless greater intervals are used to suit particular conditions.

For recording complete specimens or such fragments as retain some recognizable characteristic, Artifact Cards should be made out. The purpose of these cards is to preserve the record of the location of artifacts and any other remarks that can be entered in the field catalogue at a later date. These cards also provide necessary information in case specimens are lost and are easier for recording finds than on the level or artifact bag. Some ruled 3x5 file cards should be obtained (or 4x6, whichever are preferred), and the following information should be entered (print or type):

Site No.
Date
Pit No.
Depth
Description
Location
Remarks
Recorded by

The site number and date can be properly spaced on one line, as can the pit number and depth. A few lines should be left for the "description," and also for "remarks." I believe the foregoing is self-explanatory; it is not necessary to make out a card for every arrowpoint which is found—enter all on one card for that particular level—that is, unless something spectacular turns up that is unusual for the site, etc. It would be a good idea to make a tracing of an unusual specimen on the back of its card, or in your notebook in case it gets lost in the field or mixed with other material. Upon completion, the card should be checked, folded in half to prevent soilage, and placed in the designated level bag with the artifact. It would be wise to keep your delicate objects in a small box, or wrap them with newspaper or tissue to prevent damage.

G. Features

Material items in or about the site which are not brought back to the laboratory may be termed as features A few examples of these are storage pits, house floors, shell heaps, etc. The recognition of features of this kind on any site will depend on your care in excavation and close observation. At times they are recognized only after they have been removed or destroyed and you will learn that experience and good judgment are your best aids.

1. *Surface Features*

   These are features which are easily recognized because of their occurrence on the surface of a deposit or in the vicinity of a site. They may include bedrock mortars, quarry sites, workshops, petroglyphs, pictographs, etc.

2. *Internal Features*

   Unusual observations made during excavations should be recorded as a feature at the time of discovery, and the method of exposure should be described in detail. House floors can be recognized by postholes and fire pits. Fire pits are prominent because composed of ashes, bone, pot sherds, etc. Shell heaps can also be considered as features since they will yield formation on the diet. Concentrations of artifacts and animal and bird bones may also be considered and written up as features.

To record such data on the types of features of a site, a Feature Record Sheet can be prepared and used. Here, as a suggestion, obtain some lined three-ring notebook paper and print or type the following numbered headings:

1. Feature No. (number in sequence as they are recorded, viz: 1, 2, 3, etc.)
2. Date (Recording date).
3. Site (site number, or if unnumbered, site name).
4. Depth from Surface (depth from surface above the feature).
5. Depth from Datum (enter depth if datum plane is employed).
6. Excavation Unit (trench, pit number, etc.).
7. Horizontal Location (measurement location from datum point).
8. Definition (feature identification, name, type, etc.).
9. Associated Objects (list objects and describe briefly).
10. Dimensions (horizontal and vertical extent.
11. Remarks (other observations, etc.).
12. Exposed By (self explanatory).
13. Photo (number of picture—if none taken, state so).
14. Reported by (name of recorder).
15. Sketch (Location of same whether in notebook, reverse of this record, separate sheet, etc.).

Leave enough space for numbers 9 and 11, preferably four or five lines in order not to "crowd" the report.

X — BURIAL EXCAVATION

1. *Types of Interments*

   (a) Primary Burial—The most common type of this burial contains the remains of an articulated corpse. The skeleton may be fully extended, either on the dorsal or ventral side; semi-extended; semi-flexed; tightly flexed on either the right or the left side, etc.

   (b) Secondary Burial—This type consists of disarticulated parts of the skeleton and is also known as the "bundle burial." It is possible that the bones of primary burials were collected after so many years and re-buried, or, more likely, that in certain burial cults the bodies were exposed on the surface with later bundle or group interment of the bones. Primary burials which have been disturbed by animal burrows, etc., may often bear a superficial resemblance to the secondary type.

2. *Cremations*

(a) Primary Cremations—A large burned area containing bits of calcined bone would indicate that the corpse was cremated on the spot.

(b) Secondary Cremations — A small area of burned remains would indicate that the corpse was cremated elsewhere and the ashes redeposited in a small pit.

A. Exposing the Burial

One should acquaint himself with the names, shape and position of the major bones of the body before proceeding with the excavations of burials. This is necessary for identification of the exposed parts.

A knowledge of techniques and certain precautions will aid in the proper exposure of a burial once it is discovered. In stripping operations the skull is usually exposed first because it is higher than the other remains. As soon as a few critical points, such as the skull, pelvis, knees and elbows have been identified, one can visualize the extent and the dimensions of the burial by placing one's own body in such a position. This will give a knowledge of the working area. A satisfactory method of exposing a burial is by blocking which consists of leaving the burial embedded in its matrix on a pedestal while the surrounding dirt is cleared away and a floor level established. This gives a better working height and prevents loose dirt from going back into the burial. The height of such a pedestal will depend on one's judgment but a foot is about the average. If there is a trace of a pit, it must be preserved and this technique cannot be used. The burial is exposed from the top down, starting with the center, usually in the rib cage, abdomen and pelvis. Once this area is cleaned, start with the arms and legs, exposing them from upper to lower, the hands and feet last because of the numerous small bones that are easily disturbed or lost once they have been exposed. Special attention should be given to certain areas within a burial which may expose various types of artifacts buried with the remains. The neck, shoulders and upper rib cage may expose a necklace of shell or bone beads, while the pelvic region may produce skirt ornaments of bone, etc. Artifacts have been known to be placed near the head and beads may be found near the knees and pelvic regions, probably skirt ornaments, etc. Special care should be taken to observe the presence of projectile points in the chest cavity* and other vital regions of the body. Occasionally red ocher is found with burials which stains the bones a dull red and should be recorded as a burial association. If you are working an area where burials are known to be found, it is better to work from that section where the feet will be exposed first since it is better to have the foot bones broken than the skull.

Should you discover a small pit with bones, ashes and charcoal, you may have a cremation and careful brushing and troweling will define the horizontal limits in the surrounding matrix. A vertical profile may be obtained by cutting down in the middle of the cremation exposing a side view and showing the depth of the ash and charcoal lens. The ashes must be sifted carefully by screen to recover artifacts and large bone fragments.

(To be continued.)

Notes and Reviews

BY

JOHN WITTHOFT*

A microfilm of all of the "Pennsylvania Archaeologist" up until the end of 1954 is being prepared by the Society and is available to members, libraries, and other interested institutions at a cost of $15.00. This microfilm has been assembled because the Society no longer has the majority of back issues available for sale and because as a matter of fact it has become a very difficult matter to determine what is a complete set of the "Pennsylvania Archaeologist." This film includes every number of the "Archeologist" that has ever been published to the best of our knowledge although in a list of the bulletins certain gaps have been noted in the volume and numbers. These in some cases represent errors by the printer in assigning numbers and volumes to an issue. In other cases they represent gaps where no bulletin was published. The microfilm which we are now offering represents the first attempt to assemble and collate a complete set of the "Archeologist" and make it available as a unit to interested students.**

Book Review:

C. A. Weslager, *Red Men on the Brandywine* (Hambleton Co., Wilmington, Del., 141 pp., 1953, $3.50), is the first attempt at a history of a Delaware band or "nation." It is a semi-popular book in Weslager's usual attractive style, with a great deal of emphasis on local color, the Indian and our landscape, and personalities of the forest who influenced early Delaware and Pennsylvania history. Weslager has assembled here most of the data of history which pertain to the two Delaware towns of southeastern Pennsylvania, the one on White Clay Creek and the one at the Big Bend of the Brandywine, and he traces the history of these communities in later settlements and in the several reservations of the early eighteenth century. I believe that his treatment of the evidence concerning the original towns and the subsequent reservation settlements is the best feature of this book and constitutes a very respectable contribution to our literature. I should like to offer a couple of subsidiary notes pertaining to the towns of the early contact period, not in the sense of criticism but as supplemental notes to Weslager's excellent treatment of these problems. I believe that my statements reinforce rather than detract from his conclusions.

Weslager defers to most of our older authors in statements concerning the Philadelphia area, and accepts their assumption that the most important Delaware settlements were at the location of modern Philadelphia and in the immediate vicinity. I know of no scrap of documentary evidence for proto-historic Indian settlements in this area, and all evidence from relic collections, topography, and Indian land sales argues against the location of any Indian town here. I am convinced that the two communities which Weslager discusses were the only major Delaware settlements in Pennsylvania south of the falls at Trenton, New Jersey, during the period of Dutch and early Swedish settlement on the Delaware. My views on this point suggest that Weslager's treatment is of greater importance than he was willing to claim.

I should also like to offer a note concerning the Delaware town on White Clay Creek. Both the historic documentation and the archeological remains from this area demonstrate beyond any doubt that it included a major Delaware community of the earliest contact period. The archeological materials, collected and studied by Elwood Wilkins are mentioned but not discussed on p. 23; they deserve very full treatment, and I hope such a report will eventually be published. Little archeological material of the same age is known from any other site in this region, although it also occurs on the Big Bend Site (which has been little cultivated in recent years). Minguanan, the town on White Clay Creek, was abandoned before 1690, and was replaced by other settlements, probably including one on Chester Creek. The Indian name of the settlement is of unknown significance, and may merely refer to Minqua Creek (The Christina?), to the route to Mingo-speaking communities. The settlement-area had at least one other name, Opasiskunk, which is a very transparent Delaware compound, "at White clay." Weslager, p. 52, has erronously considered this place name to be merely a scribe's error for Passyunk; he notes that Donahue and Sipe give the term as a Susquehanna Valley place name, and states that there is no authority for their citation. This is decidedly in error; Opasiskunk was a Delaware place-name that was used as a settlement-label in the original Lenape territory, and that was later transferred to new towns in areas of new settlement. In the Susquehanna, Opasiskunk was located near Corning, New York, in 1760. John Hays called this town Wopacking, and Christian Frederick Post called it Opashiskung; in 1767 the name is recorded as Woapassisqu. Kekelappan, who signed one of the Penn deeds for a tract around White Clay, therefore had lived at Minguanan, not at Passyunk. Other documents which he signed were dated at Passyunk, because that was where the papers were drawn up and where the scribes and the interpretor, Lasse Cock, lived. Passyunk, the name for the area of Philadelphia, had the sense, "divided," thus "the forks"; the name occurs so frequently in connection with Indians merely because they went to Philadelphia to conduct business with whites.

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*Mr. John Witthoft, State Museum Building, Harrisburg, Penna.

**An index of the entire file of the "Archaeologist" has been prepared by the editor and will be published as the final issue for 1955.—Ed.

Several other notes on Indians should be mentioned, because they represent matters on which we need more information. Weslager gives Talowlis and George alias Sergaghtahman as two Indian names of a list, but the Index makes this item George Talowlis, which is not correct; they were two people, although neither is well-known. (p. 78, 144.) He gives Owhala as a variant of Machalaha (p. 52); it is very possible that these two forms were the same Indian's name, but we have been unable to find any source that equates them. They were originally equated by Albert Cook Myers in the inscription for the Minquanan monument, probably by guess. In his appendix, Weslager has collected a series of statements about the tribal subdivisions and clans of the Delaware, arranged in chronological order and selected to show variant interpretations and changes which came with improved knowledge of Indian social structures. The idea is a very good one, which might well be recommended as a full-scale project in some future publication. However, Thomas Jefferson's quotation from Charles Thomson (p. 119) is entered under 1800, whereas Jefferson was quoting Thomson's letter of 1756 from Easton; thus the citation is out of place, and, rather than being a late statement, is one of the very earliest which deals with Delaware tribal divisions and is practically the first occurrence of the word Unami. These several points of mine are not to be considered damaging to Weslager's publication; I offer them as aids to those who will use the book ,and who will find it a useful and necessary addition to our literature on the Pennsylvania Indians.

The Society for Pennsylvania Archaeology "Honor Roll"

At this writing during the month of January, 1955, our membership total passed the 600 mark and is slowly approaching another century figure. Several of our members have moved leaving no forwarding address, thus failing to receive their December bulletin. Unless they write for it in the meantime, we have no other way of communication. Arrangements for forwarding mail should be made with your local postoffice upon moving. Once again the Membership Committee is proud to announce the following names on our Honor Roll: (*indicates more than one new member)

Mr. Emil A. Alam, Aliquippa, Pa.
Mr. John de Barbadillo, York, Pa.
Mr. Edward M. Barton, Fleming, Pa.
Mr. Floyd W. Bliss, Shinglehouse, Pa.
Mr. E. N. Brandt, Merion Station, Pa.
Mr. Boyer, Lehigh County Historical Society, Allentown, Pa.
**Mr. Don W. Dragoo, Pittsburgh 13, Pa.
Mr. Richard E .Enck, Lancaster, Pa.
Mr. Sam S. Farver, Palmyra, Pa.
Mr. A. E. Feige, Hackensack, New Jersey
Mr. C. O. Fobes, Jr., New Castle, Pa.
Mr. Edward H. Freeman, New Wilmington, Pa.
Mr. Arthur A. Futer, New Holland, Pa.
Dr. Victor L. C. Haaskarl, Mechanicsburg, Pa.
Mr. Jack M. Hayes, Forty Fort, Pa.
Rev. Michael Hlavcak, Latrobe, Pa.
Mr. Emerson Hyman, Bodines, Pa.
**Mr. John S. Koch, Williamsport, Pa.
Miss Miriam Kuhns, Erie, Pa.
Mr. Roy Latham, Orient, L. I., New York
Mr. Howard M. Lindell, Tonawanda, New York
Mr. James A. Macioge, Wampum, Pa.
***Dr. J. Alden Mason, Philadelphia, Pa.
Dr. William J. Mayer-Oakes, Pittsburgh, Pa.
**Mr. P. Schuyler Miller, Pittsburgh 13, Pa.
Mr. R. J. Miller, Easton, Pa.
Mr. H. G. Omwake, Greenwood, Delaware
Mr. W. C. Reeves, Pittsburgh 18, Pa.
Mr. Kenneth L. Reigh, Bellwood, Pa.
Mr. Paul H. Sargent, Wenonah, New Jersey
Mr. Louis S. Schad, Bellefonte, Pa.
Mr. Francis M. Sheffer, Franklin, Pa.
Miss Helen E. Sheffer, Franklin, Pa.
Mr. Donald W. O Shell, Tyrone, Pa.
Mr. James L. Swauger, Pittsburgh 13, Pa.
Mr. Ray L. Taylor, Milton, Pa.
Mr. Richard Tyler, Norristown, Pa.
***Mr .John Witthoft, Harrisburg, Pa.
Mr. Chester J. Woodin, Schenectady 5, New York

The foregoing does not include the dozen or so who forgot to write their names on the bottom of the membership blank. Please do so. Thank you.

Society Notes and News

Back Issues of Magazine

Now out of stock are the following bulletins:

Volume	Number	Year
6	2	1936
22	2	1952
23	3-4	1953

The following back-issues of the "Pennsylvania Archaeologist" are still available and may be purchased by writing to the secretary-treasurer:

At 25c each:

Volume	*Number*	*Year*
1	1	1930

(This copy only is mimeographed)

3	1	1932
3	3	1933
3	4	1933
3	6	1934
5	1	1935
5	3	1935
6	1	1936
6	4	1937
7	1	1937
7	2	1937
7	3	1937
8	1	1938
8	2	1938
8	3	1938
9	1	1939
9	2	1939
9	3	1939
9	4	1939
10	1	1940
10	2	1940
10	3	1940
10	4	1940
11	1	1941
11	2	1941
11	3	1941
11	4	1941
12	1	1942
12	2	1942

At 50c each:

12	3	1942
13	1	1943
14	1	1944
15	1	1945
15	2	1945
15	3	1945
15	4	1945
16	1	1946
16	2	1946
16	3	1946
16	4	1946

This issue was misnumbered as Vol. 17, #1, 1947

18	1-2	1948
19	1-2	1949

At $1.50 per copy:

18	3-4	1948

This bulletin is the famous Snydermann Issue, the "Tree of Peace," and deals with the Iroquois Indian, his life, warfare, etc.

At 75c per issue:

19	3-4	1949

At $1.00 per issue:

22	3-4	1952
23	1	1953
23	2	1953
24	1	1954
24	2	1954
24	3-4	1954

SEND ALL ORDERS TO:

Vincent R. Mrozoski, Secy.-Treas.
407 Phillips Street
Aliquippa, Penna.

Note: Check or money order appreciated. Thank you.

INDIAN PATHS MAP

Additional requests have been received from our members for Dr. Paul A. Wallace's "Historic Indian Paths of Pennsylvania" map to put with their bulletin since they have framed the ones they received with the December publication. 300 copies, size 18½x12½ inches, on 70 lb. English Finish Book have been ordered for framing purposes. These can be ordered for the small sum of 25c which is practically the printing cost, postage and mailing expense. Send your orders in to the secretary-treasurer for as many copies as you wish. No postage, please.

TREASURER'S REPORT

The Society for Pennsylvania Archaeology

Submitted to the Board of Directors' Meeting of the Society for Pennsylvania Archaeology, Carnegie Museum, Pittsburgh, Penna., Saturday, *October 30th, 1954. This report included all transactions from May 29th, to October 30th, 1954.

*During E.S.A.F. annual meeting.

CREDITS:

Bal. May 29th, 1954	$1407.95	
Dues Received . . .	624.15	
Dividend on Stock, No. 22	2.40	
Sale of Publications . .	68.35	$2102.85

DEBITS:

Printing Costs, BULLETIN, Motor Service	$ 591.59	
Postage and Postals . .	86.00	
Expenses, Annual Meeting — State College, Pa.	14.00	
Purchase of two (2) engravings, Soc. Seal	2.55	
Membership, Pennsylvania Fed. Hist. Societies	5.00	
Purchase, Society Gold Seal Embosser	20.55	$ 719.69

Operating Balance $1383.16

Debits standing against the Society: NONE.

We hereby certify that this is a true statement of activity concerning the funds of the Society for Pennsylvania Archaeology for the period from: May 29th, 1954, to October 29th, 1954, inclusive.

John A. Leppla
James L. Swauger

Signed:
Vincent R. Mrozoski,
Secretary-Treasurer

APPLICATION FOR MEMBERSHIP

Date .... 19....

To the Society for Pennsylvania Archaeology:

I hereby request that the Board of Directors of the Society for Pennsylvania Archaeology elect me to Active (Associate, Sustaining, Life) membership in the Society. In order to expedite the transaction, I herewith send the desired fee $ ....

(Signed) ....

Name (Please Print) ....

Address ....

....

The archaeological quarterly magazine is sent free to all members.

Classes of membership

Associate (under 18 years of age)	$ 1.00
Active	3.00
Active (husband and wife)	4.00
Sustaining	5.00
Institutional	3.00
Life	50.00

All checks or drafts for membership fees or dues should be made payable to the Society for Pennsylvania Archaeology. Mail application and remittance to Mr. Vincent R. Mrozoski, 407 Phillips Street, Aliquippa, Pa.